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SYSTEM

OF

SURGICAL ANATOMY.

PART FIRST.

SYSTEM

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SURGICAL ANATOMY.

PART FIRST.

ON THE STRUCTURE OF THE

GROIN, PELVIS, AND PERINEUM,

AS CONNECTED WITH

INGUINAL AND FEMORAL HERNIA; TYEING THE ILIAC ARTERIES;
AND THE OPERATION OF LITHOTOMY.

Illustrated by Nine Copper-plate Engravings.

BY WILLIAM ANDERSON,

LICENTIATE OF THE ROYAL COLLEGE OF SURGEONS IN EDINBURGH, AND
LECTURER ON SURGICAL ANATOMY IN NEW-YORK.

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"System of Surgical Anatomy; Part First. On the Structure of the Groin, Pelvis, and Perineum, as connected with Inguinal and Femoral Hernia; Tyeing the Iliac Arteries; and the Operation of Lithotomy. Illustrated by Nine Copper-plate Engravings. By William Anderson, Licentiate of the Royal College of Surgeons in Edinburgh, and Lecturer on Surgical Anatomy in New-York."

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JAMES DILL,
Clerk of the Southern District of New-York.

TO

VALENTINE MOTT, M.D.

PROFESSOR OF SURGERY IN THE UNIVERSITY OF THE STATE OF NEW-YORK,

&c. &c. &c.

WHOSE PRIVATE LIFE IS TO HIS CREDIT AS A MAN;

WHOSE LIBERAL MOTIVES AND HONOURABLE ENDEAVOURS TO IMPROVE HIS

PROFESSION, ARE AN EXAMPLE TO THE BRETHREN;

AND

WHOSE ACQUIREMENTS IN THE SEVERAL DEPARTMENTS OF SCIENTIFIC

AND PRACTICAL SURGERY, ARE AN HONOUR TO HIS COUNTRY,

THIS VOLUME

IS PRESENTED,

IN TESTIMONY OF THE ESTEEM, RESPECT, AND FRIENDSHIP,

OF THE

AUTHOR.

PREFATORY ADDRESS.

TO THE STUDENTS COMPOSING THE AUTHOR'S CLASS IN MURRAY-STREET.

GENTLEMEN,

I AM induced to occupy the opportunity before us, to impart to you, upon the nature of this work: and to indulge also for a few moments, in consideration of the particular study which for the season just past, has engaged our mutual attention.

My design in this performance, is to present to the surgical student, and country practitioner, a correct and minute detail of such Anatomical structure as may claim the attention in operative surgery; and by the assistance of delineations from clean dissections, to supply a reference the most perfect, in the absence of the dead subject.

In the description, I have not aimed at the classification of parts as to be found in the writings of the old or some modern anatomists: but I have developed them as they are presented to the eye by the knife in the dissecting room, and upon the operating table: such a manner I have conceived most conducive to the proper understanding of the parts. In speaking of the operations also, on parts the previous surgical anatomy of which had been gone through, I have preserved the same nomenclature, and pursued the description in the same routine of succession. A second picture therefore, has been afforded of anatomical structure; which however may be found different in the shading, from the morbid appearance the parts had put on; but which will not have affected it much in the other relations.

For this First Part I have selected some popular subjects: not however altogether, because they were so, but for some other cogent reasons. Hernia is a disease, the operations for which, are formidable and big with events to the patient: a disease in its strangulated form, by no means of rare occurrence; and as likely to take place in the neighbourhood of men unacquainted with the structure of these parts, as in large cities where relief and the best talent can with greater probability be procured. When assistance by the knife is required for this complaint, there is little time allowed to refresh the memory by reading, or for examining the parts or the dead subject. I have therefore thought that a more general attention should be directed to this subject, and have accordingly done my part to put it in train. Upon the structure connected with hernia, I have introduced an innovation, having delineated and described a Crural Arch distinct, from the ligament of Poupart. This I send forth with all becoming humility, submitting the matter to the investigation of the careful anatomist, and to those who may yet have to divide the stricture of a femoral hernia in the living subject.

The operations upon the Iliac Arteries I have considered because I felt myself prepared to recommend a more safe operation for securing them with ligature than has been pursued: this also you have seen demonstrated in the College this winter, and the plan has met approbation.

The surgical anatomy for lithotomy I have also surveyed, and with the lateral operation for stone, have concluded this number. You will have an opportunity, with myself, of observing the manner in which the public will receive this part of the subject; for the critics no doubt will do it the honour of notice, either to decry innovation, or perchance to recommend it: but whichever course they may be pleased to take, I can here make my own comment.

On my arrival in this country in 1820, I found a part of the profession engaged in a controversy concerning some anatomical structure in the interior of the pelvis; when I soon resolved to investigate the matter for myself. An opportunity presenting itself through the politeness of a physician of this city, I began my inquiries, and was first taken with the continuation of the iliac fascia into the cavity of the pelvis, and its place of connexion to the side of the urinary bladder. From time to time afterwards in this city and at Philadelphia I pursued the subject, and think I have now informed myself fully upon the surgical anatomy of these parts. You have also seen them several times demonstrated, and are qualified to refer to the impressions you have received from the book of nature concerning them. The extent which was allowed for the lateral incision into the bladder I found to be much greater than had been acknowledged during the controversy touching the prostate fascia; and I think it will now be established that the whole prostate gland may, and ought to be divided by the knife in the operation, to facilitate the extraction of any stone; and that two inches of the bladder itself beyond this, may be cut when the stone is large, without endangering the patient's life, by the evils that certainly attend urinal infiltration, above this pelvic partition. When these facts shall become acknowledged, then every case of death after lithotomy, will in my opinion, admit of a ready and satisfactory explanation.

In the chapter upon the operation of lithotomy, I have observed much precision, lest I should lead the student's attention from the anatomy I had previously described: otherwise I might have introduced the subject by an essay on the doctrines of Bacon, and apply them to the expediency of possessing anatomical knowledge as the only authority for surgical practice; then, afterwards amuse my reader with a ludicrous detail of the freaks of the gorget; preceding it by a history of the several quacks to whom had been assigned the office of the cutting for stone; to point at from among them, to the itinerant Monk of the third order of St. Francis, as having cut the most with success: and afterwards brighten the detail, by recording the parliamentary gift of five thousand pounds sterling to Mrs. Stevens for rendering the operation altogether unnecessary:—when by a separate section for the purpose I might descant upon the various improvements and modifications undergone by the gorget, together with the introduction of the *bistouire cachee* in exemplification of it having been thought possible to construct surgical instruments that were already endowed with the rational faculty; and requiring only a simple push to accomplish the successful performance of a capital operation.

It is my purpose to continue the subject of Surgical Anatomy yearly, until a Series shall be completed; to comprehend as much of anatomical structure, among which the surgeon may from time to time be called upon to operate; and occasionally to intermix an anatomical description of those parts that are the seat of surgical diseases, but not requiring operations; by which I shall have an opportunity of introducing essays upon morbid structure in connexion with surgery. I design also to preserve the quarto size throughout; both for the accommodation of the plates, and that the uniformity of the set may be preserved.

With respect to the plates of this volume, I have to express my satisfaction to Mr. Benjamin A. Vitry, a young gentleman of Philadelphia, and now at Paris pursuing his medical studies; for the careful and correct manner in which he has executed those five, to which his name is attached. I think much is to be expected from him, from the talent he has evinced in this department of the fine arts. The remainder have been delineated, and the whole engraved by that excellent artist, Mr. A. B. Durand, who is too well known to be aided by my observations.

Among the laudable motives, gentlemen, which have influenced you to engage in the study of medicine; there must have been, without doubt, a strong desire to become eminent. To have been content with mediocrity was not to be expected; and to have submitted to pass among the crowd is what I am sure none of you has made up his mind. The anxiety you have evinced for anatomical investigation this winter, argues differently; and I have to congratulate, that you seem sensible of the true path, that can lead to professional efficiency. What does it avail although a man can discriminate between the characteristic symptoms of the various diseases, if he be unacquainted with the anatomical structure, which may from time to time become the seat of morbid actions? Or does it signify, however qualified a man may be in the pharmaceutical preparations of the articles of the materia medica, if he has no understanding of the economy of the animal into which they are afterwards to be introduced; and which can only be obtained by an examination into the structure of its component parts? How has it happened that the muscularity of the uterus has been disputed? surely no one could be of that opinion who had ever seen the organ in its impregnated state; far less that has had his hand made lame for a week, after the attempt to separate the placenta. But who shall dare to lift the knife to operate upon the living subject for Hernia or Lithotomy, that is not fortified with a knowledge of the surgical anatomy of the parts, confirmed by his own personal dissection?

A knowledge of anatomy for surgical purposes, is not to be obtained by simple reading. That may give an opportunity for the exercise of the memory, but it can in nowise qualify for operative surgery. By attending the lectures even of the best anatomists also, a sufficient information will not be received by the pupil. In both these cases, he has opinions merely upon trust, and has not the assurance which he has a right to expect from his own personal labours. The student should endeavour to refer his mind to the parts under dissection, while conversing or thinking on the subject; and not be content with being able to remember when and where he read of such matters; or what was the state of the weather, on that individual day when the subject was discussed in the lecture room. Associations have the best effect in assisting the memory and guiding the judgment, but if they are, in such cases, of the kind I have mentioned, they have the worst tendency; since they occupy the room of what ought to be the concomitants in thought. If however, things are otherwise, and the idea for example of the internal abdominal ring should come up in his mind, there would necessarily be rallied forth, and by the influence of this ideal attraction, the whole train of neighbouring parts; when immediately will be produced a perfect picture of the relative anatomy of inguinal hernia, almost equal to qualify the surgeon to commence the operation. This picture will be more perfect than any at the end of this work; inasmuch as they make but second hand impressions, while the other is a first edition from the book of nature itself. Solomon must have hinted at a principle like this, when he said "get wisdom, and with all thy getting, get understanding," he plainly intended to have directed the mind to the true and genuine sources of inquiry, from which only, proper information was to be obtained.

By habitual dissection, an easy use of the knife is acquired, so much looked for in an operator, by which the parts are cut with more safety to the patient, and satisfaction to those around. An operating surgeon therefore, should be a clean dissector; as most operations consist in neatly dividing and separating living parts. The student should on this account thus qualify himself, and with accuracy, in the dead subject, that by frequent employment therein, he may become so familiar with the general structure of parts, that he will not be confused or interrupted by the flowing of blood during an operation; as this will be more or less an impediment as the surgeon's anatomical knowledge is deficient. Moreover as he is frequently called to cut within a hair's breadth of a patient's life, it is highly necessary indeed, that he knows where he treads.

It is expedient also, that the surgeon be possessed of an undaunted prowess, for that is looked for by the by-standers and friends of the patient: they can discriminate and will judge of a man's talents, by the manner in which he conducts an operation. The very nerve he displays in operating, is to them indicative that he is aware of what he is about, and the coolness and decision by which he guides himself, induce them to place every confidence in him. When he is called to an accident or about to use the knife all eyes are upon him. The friends of the sufferer are agaze, but not upon the wound, or the part to be cut into; it is upon the face of the surgeon they look: towards him the husband, wife, or parent have their eyes directed; and his countenance regulates their feelings. It is for him by steadiness guided with judgment to sooth the anxious breast and to suspend the parents' fears: or by bungling and rashness to have the scene changed to one of clamour and discontent; under which no professional reputation can survive.

The surgeon therefore should have a steadiness of hand, and firmness of nerve, which no unexpected accident should dismay or intimidate.

But it is necessary also that the surgeon be the medical philosopher; he must be the complete physician; he must have the brain of a man of science; for this is the great and high qualification that the operator should possess; he must know when to operate as well as how to operate; and he must be able moreover to anticipate the issue of his patient's case. He must be the physician that he may adapt the after treatment upon which in many instances, almost wholly, the ultimate success of his operations will depend.

That you may give consideration to these few hints gentlemen, is the wish of

Your sincere friend,

THE AUTHOR.

New-York, March, 1822.

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THE

SURGICAL ANATOMY

FOR

INGUINAL AND FEMORAL HERNIA.

SYSTEM

OF

Surgical Anatomy.

CHAPTER I.

THE BONES OF THE PELVIS.

As the structures about to be described, have for the most part, connexion with the bones of the pelvis, it will be right, first to glance at these, in order that the succeeding detail may be better understood.

The bones composing the PELVIS in the young subject, are eight in number; viz. *Os Ilium*, *Os Ischium*, *Os Pubis*, on each side; *Os Sacrum*, and *Os Coccygis.* In the adult, the three first are united to form the *Os Innominatum;* but we shall describe them separately, as has been the custom.

Os ILIUM, commonly called the hip bone, forming the upper part of the os innominatum, is connected with the pubis and ischium at the acetabulum; and though the largest of the three, contributes but little, to the formation of what is properly called the pelvis. It rises upward from this cavity by a broad expanded wing, and gives support to the contents of the abdomen. Along the upper part of the bone is the *spine* or *crista*, which takes a course nearly in resemblance to the italic *ſ*, and consists of three lines; the *outer* and *inner labium;* and the *ridge* between them; these give attachment to the three great abdominal muscles. The spine of the ilium is bounded anteriorly, by the *anterior superior spinous process*, which fixes poupart's ligament, the sartorius muscle and the tensor vaginæ femoris; and at about an inch below this, is the *anterior inferior spinous process*, whence the rectus femoris takes its rise. The spine of the ilium is bounded behind by the *posterior superior* and *inferior spinous processes*, which are about an inch apart, and give attachment to ligaments, that connect this bone to the sacrum. The outer part of the ilium is called the *dorsum*, and has a waved appearance with two eminences and two depressions, corresponding to the sigmoid course of the spine, this is covered by the two great glutæi muscles, and has the glutæus minimus arising from its lower part. The inner concave surface of the ilium is its *venter*, occupied naturally by the iliacus internus muscle; and at the inferior boundary of this is a line, that assists to form the brim of the pelvis. Behind and at the inner part of this bone, is a rough surface, called from its particular appearance the *bird's head articulation;* being the part by which it is joined to the sacrum. The inferior and outer part of the ilium, forms the upper portion of the acetabulum, around which, is a ligamentous mark, for the attachment of the capsular ligament of the hip joint: and on the dorsum of the ilium, are holes for the passage of the medullary arteries.

Os ischium, is situated almost perpendicularly under the ilium, and is connected with the other two bones, by a suture through the socket of the hip joint. The *body* of the bone, proceeding from the acetabulum, is triangular; with one smooth face towards the inside of the pelvis. Below, and at the back part of the acetabulum, the body of the ischium sends off its *spinous process*, which, pointing towards the bottom of the sacrum, gives attachment to the posterior sacro-sciatic ligament. About an inch and a half below this, is the *tuberosity* of the ischium, which is the most inferior part of the pelvis, is a round and flattened knob, and supports the body when we sit; and between the tuberosity and spinous process is a *notch*, in which is lodged the tendon of the obturator internus muscle. Coming upwards and forwards, from the tuberosity is the *ramus* of the ischium, which, joining the os pubis, forms the inferior boundary of the foramen ovale: this part of the bone is flattened, and has the crus penis attached to its anterior edge. The ischium has a depression or groove along its inner surface, proceeding from the inside of the tuberosity, up the ramus; this is the route of the internal pudendal artery, which lies close to the bone in this situation: from this circumstance, if the artery should be divided in lithotomy, the hemorrhage can be restrained by making pressure with the finger until the vessel be secured by ligature.

Os pubis. This bone, in a surgical point of view, is not the least important of the three, and may be comprehended, in its body, symphysis, and ramus.

The *body* of the pubis, takes a part in forming the acetabulum; from which cavity, it proceeds forwards and inwards, being situated over the thyroid foramen, to which it is an upper boundary. At the forepart of the body of the pubis is a *depression*, formed for the lodgment of the inguinal artery and vein, in their passage over the brim of the pelvis; about an inch on the inner side of this, is an elevated point of bone, the *tuberosity*, giving attachment to the inner extremity of poupart's ligament: on the upper and back part of the body of the bone, is a line or spinous ridge, called the *crest* of the pubis, which makes the brim of the pelvis at this part, and is in the recent subject, covered by a ligamentous expansion from the symphysis, that gives origin to the pectinalis muscle; and at the under part of the body of the bone, is a *notch*, by which the obturator artery and nerve pass out of the pelvis.

About an inch from the tuberosity, inward, is the *symphysis* pubis; this is a rough surface by which it is joined to the bone of the opposite side, through the medium of cartilage. Between the tuberosity and the symphysis is a depression on which is received the spermatic chord, in its passage through the external abdominal ring. The ramus pubis now passes downwards to meet the ramus ischii; and they become united, midway, between the symphysis of the pubis, and tuberosity of the ischium;—thus the ramus of the pubis is the anterior boundary to the thyroid foramen.

The ossa innominata, therefore, are the two large irregular bones forming the sides of the pelvis, being made upon each side, of the three bones just described. They are joined together, anteriorly, at the symphysis pubis, and are separated behind at a distance, equal to the width of the sacrum.

As there are some parts, which cannot be said fairly to belong to either of the individual bones of the pelvis; they become the property of the ossa innominata. The first of these which we shall mention is

The ACETABULUM, which is that cavity on the outer surface of the os innominatum, into which is received the head of the thigh bone; and with it, forms the hip joint. All the three bones of the innominatum, as before stated, are concerned in it; and in the following proportions. The ilium affords to it a little less than two-fifths; the ischium as much more than two-fifths; and the pubis one-fifth. At that part of the cavity formed by the pubis, is a depression, by which the general concave surface of the socket is broken; this however is filled up in the living subject by cartilage, and into it also, is fixed the ligamentum teres.

The FORAMEN THYROIDEUM is a hole opening from the cavity of the pelvis, on each side, bounded by the pubis and ischium: by its existence the pelvis is strengthened and made light: it is occupied in the recent subject by a ligament which shuts it up entirely, except at its upper part, where an opening is reserved for the passage of the obturator vessels.

The ISCHIATIC NOTCH is formed in a semilunar direction, and transmits the great sciatic nerve; the pyriform muscle also passes through it, together with the glutæal, ischiatic and internal pudendal arteries. It is placed on a level with, and behind the acetabulum, and is bounded by the spinous process of the ischium and inferior border of the os ilium.

LINEA INNOMINATA. This is a ridge of bone on the inside of each innominatum, made up of the crest of the pubis, and the line at the inner surface of the ilium, found at the lower margin of its venter. This line has also been denominated linea-ilio-pectinea.

OS SACRUM. This bone is of a pyramidal shape, placed with its apex downward; is concave before, and convex backwards. In the infant it is divided into five bones, which correspond in some degree with the other vertebræ; but are not so distinctly formed: they are united by four intervening cartilaginous substances, which in the adult become ossified, leaving four bony ridges or lines over the parts of the original separation. At the ends of these lines, on the forepart of the bone, and at the sides of the bodies of these spurious vertebræ of the sacrum, are *eight holes*, answering to the spaces between the transverse processes of the other vertebræ; being four on each side; the three upper, give passage to branches of nerves from the cauda equina, which assist to form the great sciatic, and the last to nerves distributed to parts within the pelvis.

Down the middle of the back part of the bone, are little protuberances, corresponding to the spinous processes of the other vertebræ, having on each side of them *four holes* opposite the former, transmitting small nervous filaments, with minute arterial branches: these openings are much larger than is necessary for the parts that go through them, showing that they are also intended to lighten the bone. At the upper part of each side of this bone, is its *bird's head articulation;* a rough surface conformable to that within each os ilium; by these it is joined with the ossa innominata, being wedged in between them, and forming an immoveable connexion. At the upper part of the base of the sacrum, are *two oblique processes,* between which is an *oval articulating surface*, to connect it with the last lumbar vertebra. At each side of bone below the bird's head articulation is a *protuberance*, and near it, a *depression*, to which are attached the sacro-sciatic ligaments; and at the apex of the bone, is a *convex articulating surface* to connect it with the os coccygis. At the anterior part of the base, is a ridge of bone, called the *promontory* of the sacrum; made up by the projection of the oval articulating surface, that receives the last lumbar vertebra, and the anterior and upper part of the transverse processes of the first bone of the sacrum. This line, with the linea innominata of each side, completes the ring called the brim of the pelvis. The *spinal canal* of the sacrum is triangular; terminating towards the apex, sometimes in a blind extremity; but frequently, the cauda equina is exposed, from the canal being open at its lower part.

Os coccygis. This is also in the shape of a pyramid inverted: it is concave anteriorly, and composed of three or four pieces of bone. The first bone of the coccyx has a concave *articulating surface* for the end of the sacrum; also, *two articulating processes* at its upper part, over which a ligament is thrown, to unite it with the sacrum: moreover, *two transverse processes*, to which ligaments are also attached. The other bones are of the same figure with the first, but diminish in size as they descend; the last piece is longer and narrower than any of the former, and terminates in a sort of tuberosity, like the last phalanges of the fingers. The bones of the coccyx are more or less moveable upon each other until the adult age; when in the male, they usually become one bone, moving upon the end of the sacrum; but, in the female, the period of child bearing has generally gone by, before they are thus united. In both sexes, at advanced life, the coccyx joins the sacrum, pointing forwards, in continuation with the natural curve of the latter; the more completely to support the rectum, bladder, and the rest of the pelvic viscera. The os coccygis has no spinal canal.

The ARCH OF THE PUBIS, is among the important parts of this bony structure. It is bounded above, by the inferior edge of the symphysis, and laterally, by the rami of the pubes, which diverge in the male, at an angle of, from about forty to fifty, and in the female, eighty to ninety degrees.

The CAVITY OF THE PELVIS is understood to be, all that space between the linea-ileo-pectinea, and promontory of the sacrum, constituting the brim; and the extremity of the coccyx, tuberosities of the ischia, and arch of the pubis, below. This cavity is less in all its dimensions in the male than in the female; in the former, the sacrum is more turned inward and concave, and the tuberosities of the ischia also approximate more, than in the latter.

The upper part of the symphysis pubis, in the erect posture, is in a horizontal direction, with the apex of the sacrum. In the male pelvis, the diameter from pubis to sacrum, is greater than it is from side to side; but in the female, the contrary is the case; and in the latter, the distance between the tuberosities of the ischia, is about an inch greater, than in the male. The ilia are larger and more inclined in the female: hence the greater length of poupart ligament; the width also of the hips is much greater, from which the thighs are placed more obliquely, to accomplish an approximation of the knees:—thus they are more in-knee'd than the male, that the poise of the body might be preserved.

CHAPTER II.

THE LIGAMENTS CONNECTING THE BONES OF THE PELVIS.

The bones of the pelvis are firmly connected with each other by ligaments, which admit of no motion, except between the coccyx and sacrum. The shape of the bones of the pelvis, also, is calculated to render them immoveable :—for the sacrum, being placed, as a wedge, between the two ossa innominata, they are more firmly fixed, in proportion to the weight of the trunk, and the resistance afforded by the lower extremities.

The sacrum is joined to the ilium, by an intermediate cartilaginous substance, occupying the bird's head articulation. This is covered behind by a ligament called ILEO-SACRAL, which is attached at one end to the posterior spinous processes of the ilium ; and descending obliquely ; is fixed into the first, third, and fourth spurious transverse processes of the sacrum.

There are two TRANSVERSE LIGAMENTS of the pelvis, which arise from the posterior part of the spine of the ilium, and run transversely : the upper one, being fixed to the transverse process of the last lumbar vertebra ; and the one below, to the first transverse process of the sacrum.

The CAPSULAR LIGAMENT OF THE COCCYX attaches that bone to the sacrum, and includes in it an interarticular cartilage, which is of the same structure as the intervertebral substance.

The OBTURATOR LIGAMENT fills the foramen thyroideum, except at its upper part, where a passage is left for the obturator artery and nerve. This opening in the ligament corresponds with the notch at the lower part of the body of the os pubis : and, with it, forms the hole, which is sometimes giving passage to a hernial protrusion. This ligament also, is at other parts perforated by some small branches of arteries that pass towards the acetabulum.

The EXTERNAL OR ANTERIOR SACRO-SCIATIC LIGAMENT proceeds from the transverse processes of the sacrum, and side of the coccyx to be attached to the inner part of the tuberosity of the ischium: ascending the ramus of which, it becomes continuous with the triangular ligament of the urethra. By this structure, the internal pudendal artery is retained, and almost completely concealed, along the inner edge of the rami of the ischium and pubis, as it ascends towards the penis.

The INTERNAL OR POSTERIOR SACRO-SCIATIC LIGAMENT, arises, as the former, and passes transversely, to be fixed into the spinous processes of the ischium.

There are *two membraneous appendices* coming from these ligaments; the one increases the breadth of the posterior ligament, and the other, being from the anterior, ascends, within the pelvis, and becomes the *oponeurosis of the obturator-internus muscle.*

These ligaments, moreover, with the bones to which they are connected, form *two holes;* one is the sciatic, giving passage to the pyriform muscle, three arteries, and the great nerve. The other, to the obturator muscle, and the internal pudendal artery, on its return to the pelvis.

The SYMPHYSIS PUBIS is made up of a *cartilaginous interarticular substance,* which tips the end of each os pubis. This cartilage is thicker before than behind, and above and below, than in the middle of its length; so that the two form a wedge whose base is placed at the anterior part of the spmphysis, and its edge at the posterior: so that these bones seem to touch towards the inside of the pelvis. This is then covered by a capsular ligament: by which the bones are immoveably united.

This ligamentous covering extends itself into the arch of the pubis for about half an inch, below the union of the symphysis. Here it is very firm and thick, having its lower edge straight; and is quite distinct from the triangular ligament of the urethra, to be presently described. This part of it has been termed the PUBIC

LIGAMENT, and is adding to the strength of the symphysis, by being stretched across the arch, between the rami of the pubes, at their commencement.

The ligamentous aponeurosis of the symphysis, extends itsel, at its upper part, towards the tuberosities of the pubis ; giving origin there to the recti abdominis and pyramidales muscles ; then along on each side, the linea-ileo-pectinea for a little, way, affording attachment to the inner extremity of the crural arch, or, what has been called Gimbernat's ligament.

The TRIANGULAR LIGAMENT OF THE URETHRA, is stretched across the arch, between the rami of the pubes at the anterior edges of these bones. It is connected above, to the middle of the lower edge of the pubic ligament, by which a space is left on each side, for the passage of the internal pudendal arterles to the penis.

This ligament is about an inch and a half in depth, having its lower edge, semilunated, and formed into two arches, both sprung from a central projecting portion of the ligament, which will be afterwards mentioned as the *centre of union of the muscles of the perineum.* These arches are concave facing the coccyx, and go towards the tuberosities of the ischia, by processes firmly attached to the inner edge of the bone, and that terminate by being incorporated with the anterior sacro-sciatic ligaments.

We can now see how the internal pudendal artery is more or less defended, as it ascends the arch of the pubis ; since it is concealed by these two ligaments, until it is about to be distributed to the penis. This branch of the triangular ligament, moreover, assists the sacro-sciatic on each side, in sending up, within the pelvis, the aponeurosis to the obturator internus muscle.

The central projecting point, at the lower edge of the triangular ligament, is kept in its place, in giving form to these arches ; by the action of the sphincter ani, and transversales perinei muscles.

At about the middle of the triangular ligament is a *hole*, for the urethra, in its passage from the bulb.

The triangular ligament is composed of two very distinct laminæ, which are naturally separated at some distance from each other, in consequence of having between them, the glandulæ anteprostatæ, or Cowper's glands.

This ligament sends off anteriorly, an aponeurotic process, which embraces the bulb of the urethra, and binds it down upon its anterior surface; so that the corpus spongiosum urethræ, is found to terminate abruptly at the bulb, upon the triangular ligament. From its posterior surface also, there is a process of ligament sent off, which, for near an inch in length, embraces the membrane lining the urethra, and constitutes with it, its membraneous part; it then covers the prostate gland and forms to it a coat, nearly as dense as the tunica albuginea of the testis: after this it is extended to the vesiculæ seminalis, enters their convolutions, and becomes to them a middle covering.

CHAPTER III.

THE ANATOMY OF THE ABDOMINAL MUSCLES, GROIN, AND UPPER PART OF THE THIGH.

PROCEEDING in this part of the subject, to investigate anatomical structure, from without inwards; we have first exposed to our view, the

COMMON INTEGUMENTS; and it may be in place here, to contemplate the appearances these put on in the groin and its neighbourhood, before we begin to remove them. As it is absolutely necessary for the surgeon to be fully acquainted with the anatomy, into which he is about to cut, before he attempts an operation; so it is desirable, that the student should learn to anticipate the relative situation of deep-seated parts, by looking at them, as it were, through the common integuments. Being qualified to do this, the operator has an opportunity to examine himself, touching his anatomical knowledge in relation to the individual case; and immediately before he begins an operation; and besides, he is enabled to proceed, with more confidence in himself, and safety to his patient, than if he had not thus thought of the structure which was afterwards to engage his attention. This will appear more profitable, when we reflect that, after the operation has been commenced, there is bleeding; and in capital cases frequently, unexpected causes of embarrassment, to be able to surmount which, it is expedient that the surgeon shall at least have the admeasurement and relative site of parts, clearly in his mind's eye. I submit, therefore, the following hints previous to the examination of this important piece of mechanism.

But in the first place, we cannot help observing the hair on the pubis; we find this around the root of the penis, advancing, more or less, towards the umbilicus, and extending itself also, in the course of each groin. But it may be asked, What has this to do with operative surgery? I answer, it has an indirect connexion with practice, inasmuch, as it is blunting the edge of that surgeon's knife, who is careless enough to omit having the pubes shaved before he commences an operation. It is farther in the way also, in hindering a proper application of adhesive straps, after the operation for Hernia, &c. has been performed; and moreover, it is doing much mischief, from being left in these instances, by insinuating between the lips of the wound, and not only preventing a healing by the first intention, but by frequently producing an ill-conditioned sore, to the great disgrace of the profession.

I have seen this happen in operations at the groin, as well as in amputation; in which last, I have witnessed surgeons, proceed to cut, dull their knife, hack through muscle, blame the cutler, then plaster with adhesive straps; and at the first dressing, pull them off, with hairs by the roots, to the excruciating torment of the patient. I say, I have seen men who have pretended to much science in the profession, pass by all this, as if shaving the hair from a part, was not a great maxim in operative surgery.

We can plainly observe through the skin, the anterior superior spinous process of the ilium; and by feeling for the tuberosity of the pubis, we know that, in a line between these two points, is stretched, poupart's ligament, which is straight when the thigh is bent, and the abdominal muscles a little relaxed; but drawn downward towards its iliac extremity, when the limb is straightened, and the fascia lata made tense—Putting our finger midway, in this distance, and immediately above the ligament, we have it over the situation of the internal abdominal ring; and in the same direction, below the ligament, is the inguinal artery, in continuation from the external iliac, passing over the brim of the pelvis: we can here feel it pulsate in the living subject; and here, we can by pressing it on the brim, restrain any sudden hemorrhage, from the vessels of the lower extremity, until a tourniquet can be procured. Immediately at the inside of this artery, is the situation of the inguinal vein; and allowing for the width of this last, we can point to the spot, at which a femoral hernia, makes its first appearance. By casting the eye towards the umbilicus, from the part at which the inguinal artery escapes from under poupart's ligament; we are certain, of the situation and direction of the epigastric vessels. We can feel at the inner side of the tuberosity of the pubis, the spermatic chord, coming into the scrotum, from the external abdominal ring, and lying on the edge of the pubis, between the tuberosity and symphysis: and we can conceive of its situation, while in the oblique canal, since it is placed on the upper edge of poupart's ligament, from this outer opening, as far upwards and outwards, as the internal abdominal ring; and we can also trace the two tier of inguinal glands, at the upper part of the thigh. Thus in the living subject, we can point exactly, to all the important parts concerned in the structure at the groin, by observing a few principal marks from which to take our departure.

I would advise, in commencing a dissection for the parts concerned in hernia, to make an incision through the common integuments, for the whole length of the linea alba; then, at the upper part, to carry the knife towards the axilla; and below from the pubis, downward and outwards, terminating on the outside of the thigh. By this, a sufficient portion of integument may be elevated, to expose the whole of the abdominal muscles; as well as enough at the groin, to show the parts of femoral hernia. In turning back the common integuments, care must be had, to avoid raising with them, the superficial fascia: this, however, is seldom accidentally done; for we find, the student, while dissecting for the muscles, more generally to have the first layer obscured, by having left it.

Fascia superficialis. This is a membraneous structure, pervading the whole body, lying immediately under the adipose substance of the common integuments; and from being at the groin connected with hernia, deserves our consideration. We observe the muscular fibres of the external oblique, obscured by this fascia; although, we see through it their boundaries and tendinous commencement. The glands at the groin, seem but two simple elevated tumours before this fascia is removed. Poupart's ligament, however, is seen as distinctly as if this covering was absent; being incorporated with it, and can with difficulty be separated from it; as will be found in the course of the dissection. For raising this fascia, let an incision be made through it at any part, in the direction of the fibres of the external oblique, and the dissection pursued in the course of these fibres, until it is completely removed. We find that while lying upon the muscle, it sent laminæ, or processes, between the several bundles of muscular fibres: that it was them we cut through, in separating it, and that they are particularly evident in that portion of the fascia which covers the glutæus maximus. This substance, where it lies upon the tendon of the external oblique is very closely connected; therefore much care is required to make a clean display of the tendinous fibres; especially, as we loose our hold of it as we are passing the abdominal lines; it being there completely incorporated with the consolidated tendons. While trying to remove it from poupart's ligament we are almost sure to cut it through, for, as has been already observed, it appears with it, one substance. At the edge of the external ring, a process of the superficial fascia, is sent down to accompany the cremaster muscle, which it covers with the spermatic chord. This, at its upper part, is so completely connected with the ring, as to appear continuous with the tendon of the external oblique.

In removing this fascia from the upper part of the thigh, we find the glands of the groin, ready to come off with it: they having a closer connexion with the superficial fascia, than with the fascia lata; for the former sends laminæ, which envelop each gland respectively; although at a superficial view, the fascia seems only to give a general covering to them all. These connexions must be carefully dissected, in order that the glands may be left upon the fascia lata, that they may be distinctly seen in situ. The superficial fascia, from where it is covering the glands of the groin, up to poupart's ligament, is more dense than at any other part within the present limits of dissection: so that it becomes a very conspicuous covering for femoral hernia. It is also considerably thick as it proceeds from the external ring, to accompany the chord; hence as a covering to scrotal hernia, it is not inconsiderable. From the firmness of the fascia at this part, also, it is adding to the sufferings of those who are under inflammation of the glands of the groin; and does in a great measure, conceal from the touch, the existence of pus in those glands, from the close embrace which it affords them.

SECTION FIRST.

THE PARTS UNDER THE SUPERFICIAL FASCIA, SITUATED ABOVE POUPART'S LIGAMENT, AND MORE PARTICULARLY CONNECTED WITH INGUINAL AND SCROTAL HERNIA.

The ABDOMINAL LINES are now brought under view.

The *Linea Alba* is that white line, reaching from the ensiform cartilage down to the symphysis pubis. This is formed by a meeting of the tendons of the external and internal oblique and transversales muscles; is about an inch wide, and is bounded on the outsides, by the inner edges of the recti muscles, as they are seen lying within their sheaths. About midway in this line is to be perceived the *Umbilicus*, which is the cicatrix, formed from the division of the umbilical chord.

The *Linea Semilunaris*, is seen extended along the outer edge of the rectus abdominis, on each side; between it and the termination of the muscular fibres of the external oblique, commencing, at the tuberosities of the pubis, taking a semilunar course to terminate opposite the seventh rib, where it joins its cartilage. These lines, with the former, are made apparent, from portions of the tendons of the abdominal muscles becoming consolidated, at parts under which fleshy fibres do not appear.

The *Lineæ Transversæ*, are three or four tendinous intersections of the recti muscles, which run across in a direction at right angles with their muscular fibres. These lines, although not produced in the same manner as the others, have yet a similar appearance, since by their existence, the continuity of the dark muscular fibres of the recti, is interrupted.

We shall now proceed to consider the five pair of muscles, forming the anterior and lateral abdominal parietes.

OBLIQUUS EXTERNUS *vel* DESCENDENS ABDOMINIS. So called from its relative situation, and the direction of its fibres—arises, from the outside of the eight lower ribs, a little posterior to the junction with their cartilages; by as many fleshy indentations, which digitate with the serratus major anticus; being connected also, with the pectoralis major, intercostales, and latissimus dorsi.

The fibres take a course obliquely downwards and forwards, becoming tendinous at the linea semilunaris, for half its length from the thorax. Their tendinous commencement is then continued in a curved direction, convex towards the pubis; ending at the spine of the ilium. All the fibres running in the same oblique direction, are inserted, fleshy, into the outer labium of the crista of the ilium, afterwards tendinous, into the whole length of poupart's ligament,* by what is called the *inferior* or *outer column* of the tendon of external oblique, which terminates at the tuberosity of the pubis. The tendinous fibres now separate, to be next inserted into the symphysis pubis, also into their fellows of the opposite side, for the whole length of the linea alba, and into the ensiform cartilage.

In consequence of the separation of the fibres of this muscle, above poupart's ligament, a passage is made for the spermatic chord, to pass from the oblique canal, into the scrotum. This opening bears the name of the *External Abdominal Ring*. The inner tendinous boundary of the opening has been called the *inner column*, of the tendon of the external oblique. The separation between these two columns, can be traced as far, generally, as the fleshy fibres of the muscle; and is very evident when the muscle is laid bare, by the appearance of a dark shade produced by the absence of the shining tendon. That the parietes should not be weakened, however, in consequence of this; the part is strengthened by other tendinous fibres of a delicate nature, which proceed upwards and inwards, from poupart's ligament, take a curved direction, decussate, and become intimately connected with the tendon of the muscle; so that, notwithstanding, this separation of the columns, the only opening in the tendon, is the one of about an inch in length, for the passage of the spermatic chord. In the female, the external abdominal ring, is not above half this size, the round ligament which goes through it, being a less important part, and one, that would suffer less, from the contraction of the muscle. Although called a ring, its shape is more that of a triangle, the base of which is formed by that part of the pubes which is between the tuberosity and symphysis. And we shall see immediately, that, nature has provided, that the parietes should not be less strong here, in consequence of this opening, than they are at any other part.

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* As I consider the Ligament of Poupart to belong properly to no individual muscle of the abdomen, I shall describe it separately and as a distinct substance, giving attachment to several muscles and fasciæ in its neighbourhood; yet, however, as it might be allied rather to the abdominal muscles, than mentioned a ligament of the bones of the pelvis; I have reserved it for this chapter.

After a clear exposure of the linea alba, we can see in most subjects the particular manner in which the tendon of the external oblique joins its fellow. Bearing in mind the course of the muscle, it is clear, that an angle must be formed between every individual tendinous fibre, with the one on the opposite side; which angle must be directed towards the pubis: and that there must be an interlacing of those fibres at the linea alba, to complete a substantial union. That this is the case, can be demonstrated, and we consequently can trace it from sternum to pubis; but, at the pubis it is especially well marked; we can see it with half an eye, and moreover, observe connected with it, a particular economy for strengthening the parietes, behind the external abdominal ring. We find while removing the tendon at one side of the pubis, the fibres of the one on the opposite side, for about an inch and a half above the symphysis, to pass under, continuing their insertion into the pubis from the symphysis as far as the tuberosity: by which, the tendon, after interlacing at the linea alba, is sending to the opposite side a triangular portion of its structure of sufficient size to make up for the opening of the external ring, by this contrivance there is no diminution to the strength of the abdomen at the part, and it is on account of this arrangement that the ventro-inguinal hernia is of rare occurrence.*

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* Professor Colles, of Dublin, in his Treatise on Surgical Anatomy, Part First, American Edition, page 54, while speaking of two new fasciæ, proceeds, "The other, is a strong triangular fascia, arising by a pretty broad base from the crest of the pubis, anteriorly to the insertion of the internal oblique and transversalis tendons, passing immedi-

The *use* of the external oblique muscle, is to assist to sustain the abdominal viscera, to bend the body to one side; and when both act, to approximate the chest to the pelvis, by curving the spine: but when spine and pelvis are fixed, it draws down the ribs, becoming a muscle of expiration. It also assists in the act of voiding urine and fœces; by making pressure on the abdominal viscera, and thereby effecting the same upon the contents of the pelvis.

Obliquus internus *vel* ascendens abdominis, *arises*, fleshy, first from that third of poupart's ligament, which is next the ilium; and from the ilium for the whole length of the ridge, between the outer and inner labium, in a course from the anterior, to the posterior superior spinous process; then tendinous, from the back part of the os sacrum, and from the transverse processes of the three last lumbar vertebræ, by a tendon common with it, the serratus posticus inferior and latissimus dorsi. These fibres, ascending obliquely upwards and forwards, describe a radiated course, to be *inserted;* first, into the lower edges of the cartilages of the five false ribs, by as many separate fleshy slips. Becoming tendinous at the linea semilunaris, it divides into two laminæ, between which the rectus muscle is received: at the inner edge of that muscle, the laminæ come again in contact and are consolidated with the other tendons, forming the linea alba. Thus, the muscle

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ately behind the external abdominal muscle, until it reaches the linea alba, in which it terminates in a narrow point about one inch and a half above the pubis. The edge of this fascia which looks towards the spermatic chord is slightly grooved or hollowed out. When the abdominal muscles and linea alba are stretched, that edge of the ligament is seen to rise up from the pubis, and consequently to shut up a greater portion of the external ring. Another advantage derived from this ligament is that it strengthens the insertions of the tendons of the internal oblique and transversalis into the pubis. This fascia is delineated, but not marked in Plate first, of Mr. Astley Cooper's Treatise on Inguinal Hernia, nor is it noticed in his description."

After I had seen Mr. Colles' book, I lost no time, in making attempts to inform myself, concerning this new fascia: but I looked, I thought, for it in vain; notwithstanding I had the part, in every instance before my eyes. On an occasion last winter, while examining the groin of a subject, at the Philadelphia Alms House; an Anatomist entered the apartment, to whom I put the question, Have you ever seen Mr. Colles' triangular fascia? "O yes," was his answer, he "had often, very often dissected it." I urged for a sight, when he took the scalpel, and exposed to my view, the portion of the tendon of the external oblique from the opposite side, which I have described; and of which Sir Astley Cooper speaks, in the first part of his Surgical Anatomy of Hernia, page 4, in this wise: "The tendon of this muscle (the external oblique) is also fixed into the pubis, partly on the same side from which it originates, and partly on the opposite side." And moreover, this is the part which is delineated in Plate first, of his Work, but not marked, no doubt, because the muscle itself, was fully referred to.

is also inserted into the pubis at the symphysis, into the whole length of the linea alba and into the ensiform cartilage.

The *use* of this muscle is similar to that of the former; the several motions of this being rendered more complete, by its acting in conjunction with that, though in a different direction.

CREMASTER, *arises* from poupart's ligament, just before the internal oblique commences its attachment; and so near to it, that it has been described as composed of fibres, sent off by that muscle. The cremaster passes down the oblique canal before the chord, to go out with it at the external abdominal ring, and having descended with the chord, into the scrotum, its fibres are lost by being *inserted* into the tunica vaginalis of the testicle. The cremaster is flattened in its course, being spread almost around the chord, and connected to it by cellular membrane; its *use* is to assist in suspending the testicle; and by making pressure upon it, to facilitate the passage of semen along the vas deferens.

The muscle grows stronger and becomes more fleshy, from the pressure of hernia and in enlargements of the testicles;—perhaps that it might better support the weight.

TRANSVERSALIS ABDOMINIS, arises, fleshy, from the inner surfaces of the six lower ribs, digitating with the diaphragm; also, from the transverse processes of the twelfth dorsal, and four superior lumbar vertebræ: then from the inner labium of the crista of the ilium, and from poupart's ligament, for one third its length, from the spine of the ilium. The fibres of this muscle take a course directly across the abdomen, and become tendinous at the linea semilunaris; and passing behind the bed of the rectus, are *inserted* into the symphysis pubis, linea alba, and ensiform cartilage. Its *use* is, to support, and immediately compress, the contents of the abdomen.

RECTUS ABDOMINIS, arises tendinous, from the fore and upper part of the symphysis pubis; or rather from the ligament extended from the symphysis over the crest of the pubis. It soon becomes fleshy, and runs upwards, broad and flat, parallel to the linea alba. Between its upper extremity and the umbilicus, it is divided into three nearly equal portions, by transverse tendinous intersections; and there is generally a half intersection someway below the umbilicus. These seldom penetrate through the whole thickness of its substance. They however adhere firmly to the anterior part of the sheath which encloses the muscle, so as to render its separation difficult; but slightly to the posterior layer. It is *inserted* into the cartilages of the three inferior true ribs, and extremity of the sternum; and frequently intermixes with the under edge of the pectoralis major. Its use is to compress the forepart of the abdomen, to draw down the ribs in expiration, and to bend the body forwards, or to raise the pelvis. By means of its sheath and tendinous intersections, it is kept in its place, and allowed to act more effectually.

Pyramidalis. This muscle on each side, is placed before the rectus, and with it has a common origin, is situated within the sheath formed by the tendon of the internal oblique, and is *inserted* about midway between the pubis and umbilicus. Its *use* is to assist the rectus in straightening the abdominal parietes. This muscle is not always present.

Fascia Transversalis, is a membraneous expansion lining the abdominal parietes; and is situated between the transversalis abdominis and the peritoneum.

This fascia may be said to commence its attachment, behind and at the side, opposite the inner labium of the crista of the ilium, from the fascia iliaca; for these two fasciæ are continuous with each other, but differently named from the parts they occupy. Being carried along this part, it becomes attached to poupart's ligament for its whole length, and as far as the joining of the pubes, adhering there to the ligamentous aponeurosis of the symphysis: it then becomes continuous with the corresponding portion of the opposite side. The fascia now ascends the parietes immediately in contact with, and lining the transversales muscles throughout their whole extent; then meeting the diaphragm, is continued on its under surface between the muscular fibres and peritoneum, and at length descends down its crura and goes into the posterior edge of the fascia iliaca of each side, at the base of the sacrum, and back part of the ilium.

Thus the fascia transversalis with the fascia iliaca, is forming a bag, having within it all the abdominal viscera, together with the peritoneum. It is also becoming a part of the abdominal parietes, and is placed between the contiguous muscular structure and peritoneum ; perhaps, in order that this delicate membrane might be defended from friction, during muscular action.

Having thus spoken of the fascia transversalis, I now proceed to examine it more particularly as it is connected with hernia. Tracing therefore, its formation at the groin, the first circumstance that draws our attention is an opening through it, denominated the

Internal Abdominal Ring, which is situated immediately above poupart's ligament, and nearly half-way between the spine of the ilium and symphysis pubis. It is at this opening, that the spermatic chord makes its first exit from the abdominal cavity. To get at this ring it is necessary to bear in mind, that, there is sent off from its edges a *cylindrical process*, like the finger of a glove, which accompanies the chord to the external ring, making an oblique canal, in which the vessels of the chord and tunica vaginalis from the peritoneum are contained ; but excluding the cremaster muscle, which it could not embrace, from the nature of its origin.

At this stage of the dissection it may be observed, if the cremaster muscle has been left ; that it arises from poupart's ligament, somewhat nearer the spine of the ilium than where the spermatic chord is seen to come through the internal ring ; and that the internal oblique and transversalis pass before the upper part of this opening, and along the superior edge of the chord ; so that, by merely removing the tendon of the external oblique, the chord is seen in situ in the oblique canal, without at all disturbing these muscles. Thus the spermatic chord passes the under edges of the internal oblique and transversalis, and not between any of their fibres. The cremaster muscle, at this view, is also seen a round bundle of fibres lying upon the upper surface of poupart's ligament, and taking a course towards the external ring along the inferior edge of the chord.

Upon lifting the chord and opening the cylindrical process, we introduce a finger which soon finds its way into the internal abdominal ring; and we are aware of having got below the level of the fascia transversalis, by feeling the resistance afforded by the borders of this ring, and by distinguishing the reflecting angle of the peritoneum.

We are now made acquainted, that, the membrane composing the cylindrical process, sent off from the fascia transversalis; is less dense than the fascia itself: and we find that, in its natural state, we can easily tear away this envelopement of the chord, and bring to our view the edges of the internal ring, clearly defined.

We have now more evidently before us, the chord as it passes through the ring, and find it here laying in a groove, formed by the particular arrangement of *two fibrous columns*, which are the boundaries of this opening, and produced by the fascia transversalis. The ring being rather oval than round, has its longest diameter placed perpendicularly from poupart's ligament. Its outer margin does not run into the inner one, but both are lost upon this ligament in different directions. The outer margin of the internal ring is placed before the inner; crossing it, has a direction towards the pubis, and terminates in that edge of poupart's ligament which is occupied by the tendon of the external oblique; while the inner margin of the ring goes backwards and outwards, pointing towards the spine of the ilium, and is lost on the posterior edge of poupart's ligament, near the mouth of the crural sheath. Thus a groove is formed, giving a direction to the course of the chord.

These margins are, in many instances, of stout tendinous structure, especially in old people, and quite sufficient to effect a powerful contraction around the neck of a hernial tumour.

It would now be right to observe the particular relative situation of the spermatic chord in respect to the internal abdominal ring; we find it seated in the groove and occupying the lower part of the inner edge of this opening, and we can easily conceive of its being kept constantly in this situation by the weight of the testicle.

Another circumstance of moment is here to be taken notice of. The epigastric artery and vein are seen lying behind the inner border of the internal ring; the artery being found immediately along its inner edge. We observe how the chord crosses them; and this is invariably the relative situation between the chord and these vessels.

The fascia transversalis is of consequence also, as it lies behind the chord opposite the opening of the external ring, here it assists in forming the abdominal parietes; and does its part in preventing the ventro-inguinal prolapsus.

This fascia, moreover, is sending down a process under poupart's ligament, to form the anterior part of the crural sheath; but which shall be spoken of afterwards.

The density of the fascia transversalis varies much in different subjects: in some it cannot be traced further upwards, perhaps, than the umbilicus; but in others, it is easy to follow it lining the diaphragm and going down the posterior parietes, to join with the fascia iliaca.

We will now call the reader's attention to the constitution of the

Spermatic chord. This is made up principally, of the artery, vein, and excretory duct of the testicle; surrounded by a duplicature of the peritoneum, which becomes the tunica vaginalis. In addition to this, there are branches from the internal iliac and epigastric arteries, with some absorbent trunks; also, nerves from the renal and aortic plenuses, and second lumbar nerves; all which are accompanied into the scrotum by the cremaster muscle.

The spermatic artery takes its rise from the forepart of the aorta, a little below the renal artery, and runs towards the pelvis, along the psoas muscle, having crossed the ureter; and arrives, at length, opposite the middle of poupart's ligament, to pass through the internal abdominal ring. Here it covers the root of the epigastric artery, and continues in the course of the inguinal canal, entering into the composition of the chord. While in the abdomen, the right spermatic artery passes over the vena cava, and the left goes behind the cholic arteries. This artery having got into the scrotum, is much convoluted, and is dispersed upon the epididymis and body of the testicle, to do the office of secreting semen.

The spermatic vein passes from the testicle along the chord, into the abdomen;

it is larger than the artery, and forms a plexus that accompanies the latter; and which, opposite the lower end of the kidney, ends in a single trunk; that, on the right side terminates in the vena cava, and on the left, goes into the left, emulgent vein. These veins abound in valves.

The VAS DEFERENS is a cylindrical cartilaginous tube, through which the semen is conveyed to the vesicula seminalis. It proceeds from the posterior and inferior part of the epididymis, and continues its course along the back part of the spermatic chord. Its calibre is very small in proportion to the size of the tube; it is hard, and feels between the fingers, like a whip chord. The vas deferens ascends through the oblique canal; and at the internal ring, separates from the spermatic chord, passing downwards and backwards along the psoas muscle, and is fixed to the side of the bladder, just there the peritoneum is reflected to go to the side of the pelvis. It then crosses the ureter and proceeds from behind forwards between the vesiculæ seminales. Behind the prostrate gland the two vasa deferentia are nearly in contact; they are at this part considerably expanded, and each joins with a vesicula seminalis at acute angles. These then unite, forming a tube about an inch long, common to them both; which perforates the prostrate gland, and terminates, by opening into the urethra, by the side of that prominence called *caput gallilaginis.*

TUNICA VAGINALIS. This is a process of the bag of the peritoneum, accompanying the testicle into the scrotum. Each testis is lodged in the fœtus, within the abdomen below the kidney, lying upon the psoas muscle; being covered on its forepart and sides, by peritoneum. About the eighth month it descends into the scrotum, being directed into that part by a ligamentous substance, called by Mr. Hunter the *Gubernaculum.* Now its attachment with the peritoneum being continued, this membrane is drawn down with it into the scrotum; and the testis, while within the abdomen being on the outside of the cavity of the peritoneum, it is necessarily, when it arrives into the scrotum, without the cavity of that pouch given off by the peritoneum, namely, the tunica vaginalis: and moreover, in consequence of more peritoneum being brought down into the scrotum, than is in close adhesion with the testicle, we have a loose or reflected portion of the tunic; and between the two is the cavity of the tunica vaginalis, in which is contained the water of hydrocele. We have also this process of peritoneum divided into two portions. The tunica vaginalis of the chord has its cavity generally obliterated soon after birth, by an adhesion between that part which closely invests the vessels of the chord, and that which is reflected around them. When this, however, is not the case, a ready passage is afforded for intestine, constituting the disease of congenital hernia. The tunica vaginalis of the testicle, however, continues to retain a circumscribed cavity; and the inner surface of the membrane secretes a liquor for its lubrication.

Although this membrane is in continuation with the peritoneum, yet, it does not seem to inherit the high irritability of that very sensible organ. And we can excite great inflammation in the tunica vaginalis, for the radical cure of a hydrocele, without fearing an erysipelatous state of the peritoneum as a consequence. It would appear, from the circumstance of the obliteration of the cavity at the chord, that all communication was cut off, in regard to the propagation of erysipelatous inflammation between these two surfaces.

From what has been said, it will be observed, that the spermatic cord between the testicle and abdominal ring, is made up of several vessels, covered first, with a double peritoneal coat; next by the cremaster muscle, and, over all, by a covering, which is a process sent down from the external ring, by the fascia superficialis.

The OBLIQUE CANAL is that space between the internal and external abdominal rings; bounded anteriorly, by the tendon of the external oblique muscle; posteriorly, by the pubic portion of the fascia transversalis; superiorly, by the lower edges of the transverse and oblique muscles: and inferiorly, by the upper edge of poupart's ligament. What we meet with then, in this canal, is the spermatic chord, covered by the cylindrical process from the internal ring: also the cremaster muscle, lying at its lower edge: both of which take an oblique course downwards, towards the inner and upper part of the thigh; and then fall perpendicularly into the scrotum.

In the female, the contents of the oblique canal are simply, the round ligament of the uterus, which takes a similar course with the chord in the male, and is covered also, by a cylindrical process, from the fascia transversalis.

The existence of the oblique canal, as affording a course to the chord, renders the security against hernial protrusions more complete than if the chord had taken its passage from the abdomen, immediately behind the external ring: and this valvular structure, moreover, is adding to the strength of the parietes, when pressed upon generally, by the abdominal viscera.

I take occasion to have inserted here, a communication upon the subject of the inguinal canal in the Fœtus, from the late Allan Burns, of Glasgow, sent to Dr. Alexander Monroe, of Edinburgh, and published in his Outlines of Anatomy, Vol. 2, p. 97: printed in 1813.—And, as it affords an excellent view of these parts in the new-born infant, I trust it will be considered a valuable addition.

"In the fœtus, or new-born male, we find that the tendon of the External Oblique muscle, at its inferior and anterior part, separates into two pillars, which leave between them an irregular opening, through which the cord passes. One of these pillars runs below the cord, the other above it. Both pillars tend obliquely downward and forward, inclining toward the crest of the pubes, where one is completely lost, the other in part implanted. That fold which passes below the cord is completely implanted into the tough ligament which covers the tubercle of the pubes. The other pillar, when it reaches the pubes, separates into two bands; the posterior, or deeper-seated, is inserted along with the lower pillar into the tubercle of the pubes, and even extends to the opposite side. The other, and by far the most important fillet, winds obliquely inward; then bending backward between the penis and the cord, it at last incorporates itself with the fascia, covering the heads of the triceps longus, the gracilis and flexor muscles of the leg; and in some cases, it can be traced much farther, and reaches even to the tendon of the glutæus maximus, to which it is attached. The slip from the upper pillar of the canal, is always inseparably joined to the fascia covering the cremaster: indeed, it may perhaps most properly be described as a part of Camper's fascia, attached to the ring. I thought that this structure had not been noticed by any author. I find, however, that it has not escaped that indefatigable anatomist, Camper, who delineates it very accurately in his plate. It is easiest detected by slitting up Camper's fascia, by which I mean the sheath of the cremaster, till we come near to the ring. When we have done this, if we then insinuate the point of the finger into the lower orifice of the canal in the adult, or ring in the child, we find that we are prevented from carrying the finger towards the pubes.

"This part of the canal merits peculiar attention; for whoever is ignorant of the position and connexion of this production from the upper pillar of the ring, can possess only a very confused notion of its action in disease.

"When I shall have stated the anatomy of the groin in the young subject, and have pointed out the changes which take place on these as life advances, I shall then have occasion to notice the effect of this fillet in preventing the formation of hernia; and also, we shall see that when a protrusion has actually taken place, it has a considerable share in preventing reduction.

"When we have examined in the very young subject, the structure of the external orifice, through which the cord passes, we have seen all that is most worthy of notice, for in the very early part of life, the inguinal canal is not formed. In proof of which, take a new-born male, in whom the tunica vaginalis communicates with the cavity of the abdomen, and make a puncture into the former, through which one of the blades of a pair of scissors is to be introduced, and passed to the belly, then all that portion of the tunica vaginalis, which is above the puncture, is to be snipped through. By doing this, we lay the abdomen and tunica vaginalis into one, and we at the first glance perceive whether the cord, at this early period of life, passes in an oblique direction between the muscles and transversalis fascia.

"I have never observed the cord in any obvious degree *oblique* in its course; in an infant at birth, it runs in a *straight line* from the psoas muscle to the bottom of the scrotum.

"It passes through *a mere aperture.*

"When, however, we take a subject even a month old, and treat it in the same way, we find then *a very apparent obliquity* in the course of the cord. As, however, it is very rare to meet with an infant of that age, in whom the tunica vaginalis remains pervious, we may, where its canal is obliterated, by slitting up Camper's fascia, and entering the blade of a sharp-pointed pair of scissors into the lower outlet of the canal, pass it up till it appears in contact with that part of the peritoneum which invests the cord at that spot where it passes from the abdomen. If we divide completely what is between the blades, we expose fairly the *degree of obliquity of the cord.*

"If we examine, in a similar way, subjects of different ages, we find that the older they become, till they arrive near the edge of puberty, *so much the longer does the inguinal canal become.*

"It may here be worth while to inquire how the canal comes to be formed, and what changes take place on the neighbouring parts. As I have already mentioned, the upper and lower openings of the fœtal ring are *opposite to each other*, and so very little distant the one from the other, that there is hardly a palpable space between them. The ring is placed just in contact with the tubercle of the pubes. From this fact, it must at first sight appear, that the lower outlet is in the fœtus, in the same spot which it is afterwards to occupy in the adult. In proportion, therefore, as the fœtal ring is changed into the adult canal, it is the *internal orifice* which changes its position; it is the upper opening which mounts toward the spine of the ilium. We may from this very readily understand, that it is *from the gradual extension of the transversalis fascia*, in that direction, that the cord comes to be enclosed in a canal. A very simple contrivance gives a very clear idea of the manner in which the inguinal canal is formed. Let any one take two slips of paper of the same length, and cut two small holes in the centre of each; let him then lay these holes opposite to each other, and pass through them a quill or pencil-case. When he has done this, he has a very good plan of the state of parts about the groin in the fœtus. If he now hold the papers opposite him, and then pull to a side the one nearest to himself, he will find, that by doing this, he comes to lay the quill between the pieces of paper in the same way that the spermatic cord, by the extension upward and outward of the internal orifice of the ring, comes to be lodged in a long canal. And he will also see, that the length of the canal must vary according *to the greater or less extension of its posterior side*. Many have also been puzzled to comprehend how the epigastric artery can bear precisely the same relation to the cord in the fœtus and adult, seeing the difference which has taken place in the relative position of the internal orifice of the canal. This difficulty only occurs to those who do not properly understand the mechanism of the parts. One who has made himself acquainted with the real structure, is never difficulted in following the changes. If the state of parts in the very young subject be known, and if the surgeon have examined those at an advanced period of life, by comparing the one with the other, he has at once unfolded to him the mode in which the fœtal ring is changed into the adult canal. He is taught, that it is a natural consequence *of the oblique extension of the transversalis fascia* towards the spine of the ilium. He sees that, in proportion to the degree in which the posterior side of the canal overlaps the anterior, so must the length of the canal vary. If he take a just and comprehensive view of these parts, he will be able to see, in the structure, a wise provision of Nature to prevent protrusion at the groin, and he will also be led to deduce some pathological inferences from the data before him. He will be prepared to understand why inguinal hernia is much more frequent in young than in old subjects; why it is often cured in the former, and seldom in the latter; and why in the one it is a more dangerous affection than in the other.

" In the very early period of life, the cord, as we have just seen, passes through a *mere aperture ;* and besides, there is an open communication between the tunica vaginalis and the belly. From these circumstances, therefore, a portion of gut is forced down along the cord, forming congenital hernia ; or, if the tunica vaginalis be obliterated, a new peritoneal sac passes through the ring by the side of the cord. As, however, the parts are more dilatable in the young than in the old person, so is hernia, *cæteris paribus*, more readily reducible in the former, and consequently less dangerous. The gut, in the first instance, in the young subject, passes through a *simple ring;* but if the hernia be allowed to remain, then in many cases the upper orifice ascending towards the spine of the ilium, as it ought to do, comes in the end to lodge both the hernial sac and the spermatic cord in a complete canal; and this will probably be found to be the reason why surgeons believe that hernia does often take place along the canal. They see a herniary tumour in advanced age, lying in the oblique course of the canal; but they forget to inquire when the protrusion took place, and what was the original appearance of the tumour.

"Were they to trace their cases to their origin, they would most probably ascertain, that, in the first instance, the hernia had appeared in infancy; that it had been *less oblique at the beginning, but imperceptibly became more and more so.* I speak from what I have seen in several instances. Among a considerable number of patients, in whom the hernia was lodged in the canal, and of some of which I have casts, I have uniformly, by applying to the friends, ascertained that the rupture had taken place in infancy, and had slowly assumed the oblique direction. Some of the nurses have even said, that when, immediately after birth, they attempted to return the gut, they found that it had passed through a hole, about large enough to admit the tip of their little finger; but, when the child was older, they found it run more to a side.

"In the advanced stage of hernia, the parts are brought into precisely the same state they were in when the disease began. In the congenital hernia, or in the common inguinal hernia taking place in a very young child, the sac passes through *a mere aperture;* then, in time we have seen, that, owing to changes which this opening undergoes, the gut comes to be lodged in a *fully formed canal.* This continues till the tumour becomes large, when the posterior side of the canal is, owing to the pressure, slowly absorbed; and again the upper and lower orifices are brought opposite to each other. Again, the hernia resembles, in its appearance and course, the incipient tumour.

"If the view which I have given of the mode of formation of the inguinal canal be correct, it will lead to this conclusion, that we ought, in every case of hernia in a young child, most sedulously to prevent the descent of the gut, and, if possible, to return also the sac, where it is not congenital rupture; for if we do this, we bid fair to cure the disease, by allowing of the *extension of the posterior side of the canal along the cord.* This observation leads me to a review of the influence which the different parts of the inguinal canal have in preventing the accession of hernia.

"In the very young child, there is no security against hernia, except what arises from the cord filling the aperture through which it passes. This is generally sufficient; for the infant is exposed to few of the exciting causes of the disease.

"When, however, the child advances in years, in the course of its amusements, and afterwards of its business, it is more and more exposed to the causes of hernia.

"Nature has, however, wisely provided, that in proportion to the danger, the security should be increased. The posterior side of the canal overlaps every day more and more the anterior side; consequently, when the canal is completed, any pressure against the posterior side, tending to produce hernia, has *the effect of laying that side more firmly in contact with the cord;* of forcing the latter steadily against the anterior side, where the fibres of the transversalis and internal oblique muscles react upon it. Thus, a most perfect valve is formed; and where the posterior side of the canal is fully extended, it is impossible that inguinal hernia can take place.

"I have already attempted to show, that where the gut has passed down in infancy, it may, in the end, come to be lodged in a canal; but this is very different from a hernia passing along the canal for the first time in an adult. By the overlapping of one side of the canal over the other, hernia is prevented from primarily taking place in the adult, by the internal orifice of the inguinal canal.

"Although, for the reasons above stated, hernia cannot often, if ever, take place by the upper orifice of the inguinal canal; still, was there not some contrivance devised, it might happen, by bursting the posterior side of the canal opposite the lower orifice.

"The posterior side of the inguinal canal is formed, as was first demonstrated by Mr. Cooper, by the transversalis fascia, which is thin and dilatable, and, therefore, independent of assistance, affords but a trifling barrier to protrusion. Nature has not, however, neglected this point; for, opposite to the inferior opening, she has strengthened the posterior side, by *a set of inflected fibres*, which arise, as described by Camper, from the folded in lower pillar of the oblique muscle, and run upward, expanding over that portion of the transversalis fascia opposite to the lower outlet. This affords one security; but nature seems peculiarly solicitous about defending this opening, and has therefore bound the two pillars firmly together, by cross slips, and made to arise from the upper one, a fasciculus of fascia, which by winding round the top of the thigh, must, in these motions which would endanger the parts, be made closely to embrace the cord, adapting thus, in a most accurate manner, the size of the lower outlet to the size of the cord.

“ We thus see, that, *by the posterior wall of the canal, inguinal hernia is, in the adult, prevented from taking place through the upper orifice*; and that, by the peculiarity of the mechanism of the lower opening, *ventro-inguinal hernia* cannot occur, except where, by violence, the posterior side of the canal is burst, or the cross slips torn, by which the fillet from the upper pillar would come to lose its effect.

“ When hernia has taken place, the very objects which formerly had a tendency to prevent its accession, are now so far changed in their action, that they present obstacles to the replacement of the gut. If the hernia has occurred in a young subject, where the canal is not formed, or in an adult in whom the posterior side is wanting, which is not a very rare malformation, then our only difficulty must depend on the action of the lower outlet. In this case, the cross fibres which bind the two pillars together, act on the sac; and the fillet, from the upper pillar, embraces it closely, but not equally, in every direction of the limb. When the toes are rolled inward, and the thigh, on the affected side, pulled from the other, and turned backward, this fillet is sunk into the sac, and retains it immoveably in its situation.

“ This species of stricture may most readily be overcome, by moving the member in an opposite way; and, I believe, in knowing how to humour the parts in the taxis, the great superiority of one surgeon over another consists. When, however, the rupture has taken place in infancy, and continued till the complete extension of the canal is accomplished, then, besides this source of difficulty, there is also a source of embarrassment, arising from the reaction of the fibres of the transversalis and internal oblique muscles upon the sac, which occasion a species of stricture, in which bloodletting, warmth, and the relaxing the muscles by bending the body sideways, facilitate the reduction. The above remark applies to that species of incarceration dependent on a narrowing of the internal orifice of the canal."

SECTION SECOND.

THE PARTS UNDER THE SUPERFICIAL FASCIA, SITUATED BELOW POUPART'S LIGAMENT; AND MORE PARTICULARLY CONNECTED WITH FEMORAL HERNIA.

After having lifted with great care the superficial fascia, we have presented to our view, first, the

Inguinal glands. These are arranged in two sets, and are placed on the fore and upper part of the thigh. The upper chain of inguinal glands are from five to eight in number, are situated above the termination of the saphena vein, and take a course upwards and outwards, towards the spine of the ilium. The next cluster amount to about three or four; are placed at about two inches below poupart's ligament, at the outside of the saphena vein, and lodged upon the fascia lata, a little below the inferior extremity of the falciform process.

The subcutaneous absorbents of the thigh, take the course of the saphena major vein, and enter the lower cluster of inguinal glands, previously to perforating the crural sheath. There are some of them, however, which pass these glands, and enter the sheath directly. The deep-seated absorbents of the lower extremity, take their course with the great vessels, and enter the abdomen in company with the inguinal vein.

The superficial absorbents of the penis, and external parts of generation in the female, are received into the upper tier of glands of the groin; after which, part of them perforate the crural sheath, and part go through the iliac portion of the fascia lata; and in this way, find a passage under poupart's ligament.

The EXTERNAL PUDENDAL ARTERIES are here to be met with at this stage of the dissection. They are three branches coming from the femoral artery, a little below poupart's ligament, at a small distance from each other. The upper one crosses the heads of the pectinalis and gracilis muscles, and gives branches to the inguinal glands, to the scrotum, and anastomoses with branches of the epigastric artery. The small branches of this artery, which are proper to the scrotum, in some cases of large scrotal hernia alter to a considerable size. The other two external pudics arising a little lower down from the femoral, are soon subdivided, and distributed upon the heads of the triceps adductor femoris, the pectinalis, the skin of the scrotum, the integuments of the penis, and skin of the abdomen covering the pubes.

FASCIA LATA. Upon taking away the glands of the groin, we find the muscles of the thigh enveloped in a thick, shining membrane, of fibrous structure in many parts, and stretched downwards, from poupart's ligament, the arch of the pubis, and spine of the ilium. There is one muscle, however, appearing on its outer side, the *tensor vaginæ femoris,* which proceeds from the spine of the ilium, down for about four inches, to be incorporated with its substance, serving to make it tense, for the support of the muscles of the thigh, when they are required to act. Upon this fascia, we see coming up the inside of the thigh, the saphena major vein, which is joined generally, by a smaller branch, about an inch before it goes through the crural sheath: but of these we shall speak when we come upon the great vessels.

This fascia, at the upper and forepart of the thigh, is divided by an opening, into two portions, which have been termed, the pectineal or pubic, and the iliac portion of the fascia lata.

The *Pubic portion,* is that part which covers the gracilis and pectinalis muscles, and which, when it approaches the situation of the deep vessels, becomes thin at its upper part; and dipping under the sheath in which they are contained, is then lost among muscular fibre.

The *Iliac portion*, on the other hand, coming inward from the outer part of the limb; proceeds before the sheath of the vessels, covers, about two inches in width, of the upper part of the thigh, and terminates in an abrupt edge, but which, at about two inches down from poupart's ligament, is still carried inwards and lost in becoming continuous with the pubic portion. The density of iliac portion, even as far as this edge, is much greater than any part of the pubic portion. In ordinary cases, but especially in some old subjects, this termination is abrupt and clearly defined: hence, we have what has been called the *falciform process of the fascia lata.* This at its upper part, does not keep the straight line of attachment with poupart's ligament; but goes down by the inner side of the crural sheath, keeping adhesion to Gimbernat's, or Hey's femoral ligament; a bundle of ligmentous fibres, which I shall afterwards describe distinct from poupart's ligament.

It is perhaps, in some degree, difficult to get a good view of the falciform process; but I would urge my reader, from being disappointed in one or two dissections; not to adopt an opinion in circulation, that the falciform process is the creature of the knife. He will reflect, that the inguinal glands are very liable to inflammation, which if beyond a very slight degree, more or less adhesion, with the surrounding parts, must be the consequence. Thus, we rarely meet in a dissecting room, with an adult subject, who has not had at one time of life or other, inflammation of the glands of the groin. In such cases it will require some little assistance with the knife to make clear this semilunar edge. Also, if there is obesity, or anasarca present, it is not expected to be clearly defined. In many subjects, however, I have lifted the glands with the handle of the knife, and the falciform process has appeared under view, without any further dissection. In every case, the inferior termination of this semilunar edge should be first sought for: it can be clearly seen passing into the pubic portion over the edge of the crural sheath, just between the two strings of inguinal glands, where from the circumstance of this situation, it is not so likely to have been obliterated by inflammation. From this part it can be easily traced up to Gimbernat's ligament: then by putting the handle of the knife under it, it is found to be very distinct from the anterior part of the sheath of the femoral vessels. After the parts are dissected, and the dipping of the pubic portion observed, the falciform edge will be found to be the necessary termination of the iliac portion. By this arrangement then, an opening is formed through the fascia lata, at the upper part of the thigh, from which the upper and inner part of the crural sheath is seen exposed at this stage of the dissection, and it is through this opening that the saphena vein and subcutaneous absorbents of the thigh, have passage before perforating the sheath of the femoral vessels.

Let the fascia lata now be carefully removed, so that the femoral sheath be not disturbed; and we will proceed to the consideration of

Poupart's ligament. This is a firm ligamentous substance, stretched between the anterior superior spinous process of the ilium, and tuberosity of the pubis. It runs in a straight line from ilium to pubis; but, has this course altered, according to the contraction of the abdominal muscles, and the particular state of tension of the fascia lata of the thigh. It is a kind of centre of union for the fasciæ at the groin. This ligament has been confounded, with what I think more properly may be termed the crural arch; for there is nothing of an arched appearance in this ligament, it being found to run in a line direct.

Poupart's ligament is very thick, appearing grooved on the upper part of its pubic extremity, where rests the spermatic chord; in consequence of which, it seems rounded anteriorly and inferiorly, where the tendon of the external oblique and fascia lata of the thigh have their connexions; and this grooved and convex appearance at its forepart, may be attributed as much to the form given by these connexions, as to the ligament itself.

Although poupart's ligament has its attachment at the tuberosity of the pubis, a little broader than at the iliac extremity, yet it is not there sufficiently wide to reach the inner angle of the crural sheath, and to form a stricture in a femoral hernia. The whole of poupart's ligament may be removed; yet the mouth of the crural sheath will be found supported by a ligamentous structure, quite adequate in itself, to confine an intestinal protrusion.

The parts, having connexion with poupart's ligament, are first the fascia lata of the thigh, which is joined to it for about four-fifths of its length from the ilium: the iliac portion of that fascia dips down near the pubis, to follow the mouth of the crural sheath, becoming the commencement of the falciform process. The pubic portion is not attached to the ligament, but to the crest of the pubis, over the pectinalis muscle.

The tendon of the external oblique is next connected with poupart's ligament, being attached to its upper and anterior edge, for its whole length: thus the ligament appears drawn up at this part, forming a groove for the chord, and assisting in the anterior boundary of the oblique canal.

The internal oblique and transversalis are also adhering to this ligament, occupying the centre of its upper part, for a little more than one-third of its length from the spine of the ilium; and the fascia transversalis is connected with it behind, but not at every part with uniform firmness. At about the central, three-fifths of the length of poupart's ligament, this fascia is continued down under it, to form the anterior part of the sheath, for the great vessels of the thigh. Here it is loosely attached, appearing to be drawn from that by another ligament, which is a band, running immediately in the course of the anterior part of the crural sheath; and which I shall presently describe under the name of the crural arch. The margins which form the boundary to the internal ring, however, are closely united with poupart's ligament, and go into it in the particular manner noticed, while upon that part of the subject. The fascia transversalis is also intimately connected with poupart's ligament, or one-fifth from the ilium, and one-fifth its length from the pubis.

Beside these, the superficial fascia is incorporated with poupart's ligament, as described while we were speaking of that aponeurosis.

The CRURAL ARCH. I am perfectly aware, that in the majority of instances, what I am about now to delineate, has the appearance of unity with poupart's ligament: but from having so often seen them separate, I have ventured at a method of description, which is a little out of the common order, pursued by anatomists. I am not, however, altogether without precedent for this plan, since Mr. Hey, in the first edition of his Practical Observations on Surgery, had adopted it; and moreover, as Mr. Robert Liston, has written a book solely upon the subject of the crural arch.*

In the course of my late dissections, I have been frequently led to a very careful examination into the ligamentous structure at the groin; in order that I might satisfy myself of the particular disposition of those tendinous fibres, which form the ultimate seat of stricture in femoral hernia.

As was to be expected, I found the ligament, of Poupart, running in a straight direction, after the parts connected with it were in a relaxed state; but I also observed, what has been described as the third insertion of the external oblique muscle, to be a considerable ligamentous band, running in an arched course, in the direction of the anterior part of the crural sheath, having its inner attachment from the ligament covering the spinous ridge of the pubis, about an inch from the tuberosity; and outwardly, its fibres seemed to seek connexion with the inferior anterior spinous process of the ilium, by going between the psoas and iliacus muscles, as they come out of the pelvis.

This crural arch at its inner and upper part, I have seen in many instances, quite distinct from poupart's ligament, having only a membraneous joining with it, similar to that uniting the two columns of the tendon, of the external oblique, as they go to form the external ring. At about the centre of this arch, however, the fibres become in close contact with poupart's ligament, and firmly adhere to it, by which their arched course is sustained; yet the fibres are not incorporated here with those of poupart's ligament, as can be determined by maceration.

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* Memoir on the Formation and Connexions of the Crural Arch, by Robert Liston, Memb. Coll. Surgeons, and Lecturer on Anatomy and Surgery, &c. &c. Edinburgh, 4to. 1819.

After passing this centre, the fibres of the crural arch are again separating from those of poupart's ligament, and are disappearing between the psoas and iliacus internus muscles. Thus we have a ligamentous structure, distinct from poupart's ligament, distant from the tendon of the external oblique, having attached to it, in close union, the process of fascia transversalis, that descends into the thigh, and prescribes the limits to the mouth of the crural sheath. It is this which Gimbernat found only necessary to divide, to relieve the stricture in femoral hernia; and it is this also, to which Mr. Hey, in the first edition of his Surgical Observations, has given the name of the femoral ligament.

Now, although the separation between the fibres, of what I have here called exclusively, the crural arch; and those of poupart's ligament, is not always to be found equally distinct; yet the arched course of the one set, I believe to be always present, in opposition to those of the other, which from the nature of their attachment, must run in a direct line. That the crural arch is always to be found, is proved by the acknowledged invariable oval shape of the mouth of the crural sheath, when beheld from the abdominal aspect.

To the fact then: that, immediately in contact with and over the anterior part of the mouth of the crural sheath, binding it down from the linea-ileo-pectinea, at about an inch from the tuberosity of the pubis, to the os ilium below the superior spinous process; are tendinous fibres running in an arched direction, and placed, throughout their course, from being in contact with, to within the distance of an inch below poupart's ligament; also that, it is the sharp and inner edge of this, which becomes the principal and ultimate seat of stricture in femoral hernia;—does this practical inference follow?—that we are not to expect much relief to the strangulated intestine, in femoral hernia, by elevating the thigh and relaxing the muscles and fasciæ, connected with poupart's ligament. Hence, we are not to hold in high expectancy, the reduction a femoral hernia, by the taxis; for we are told by Sir Astley Cooper, that, " in the inguinal hernia, the parts are so connected with muscles, that any relaxation brought upon these, affects the aperture through which the hernia descends; but in the crural hernia, the seat of the stricture is in parts less connected with the action of muscles, and general relaxation has but little effect upon them" and "the delay of the operation, which I lamented and condemned, when speaking of inguinal hernia, is to be still more deprecated in the crural; for death very generally happens earlier in the latter disease than in the former."* And Mr. Lawrence also, notwithstanding he has disagreed with Mr. Hey's notions, of a femoral ligament or crural arch, distinct from the ligament of Poupart, speaks with some emphasis, in reference to the hope, that is to be entertained, for the reduction of a femoral hernia by the taxis. "Let the practitioner remember, that the smallness of the mouth of the sac, and the consequent tightness of the stricture, diminish the chance of effecting a replacement of the rupture, by means of the taxis; and consequently, that when the incarceration is completely formed, he should not waste much time in attempts of this description.†

CRURAL SHEATH, or the sheath for the femoral vessels, is a membraneous canal, made up from the fasciæ transversalis and iliaca, and passing down the thigh from the pelvis, contains the femoral artery and vein.

The fascia iliaca, which has not yet been described, but which will be found seated under the iliac vessels within the pelvis, sends down a process from its substance that passes out behind the femoral vessels, and over a part of the pubal portion of the fascia lata, to which it adheres. Being continued down the thigh, in this relative situation, it forms a bed for the femoral vessels, and becomes the posterior part of the femoral sheath. The fascia transversalis, on the other hand, sends down its process of similar dimensions under the crural arch, and provides the anterior part for the femoral sheath; these processes, joining at the sides, become one substance, which embracing the femoral artery and vein, is identified with the canal for the great vessels of the thigh.

The crural sheath is about two inches and a half wide at its commencement under the arch, but it soon becomes narrow as it goes down the thigh, getting in closer contact with the femoral vessels: hence, it is of a funnel-like form, the upper part of which affording more room than can be occupied by the femoral artery and vein.

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* Anatomy and Surgical Treatment of Hernia, Part II., page 15.

† Treatise on Hernia, by Wm. Lawrence, Esq. London, 1807, page 244.

As soon as we have laid bare this sheath, the convex appearance of its upper and forepart is particularly striking; this is a shape given it, as before stated, not by poupart's ligament, but by the crural arch. We can now see at what part of the sheath the saphena vein enters to empty its blood into the femoral; that it is at the inner and forepart, about an inch and a half from its commencement: and we observe also, that the fore and inner part of the sheath, a little way from the crural arch, is the place at which the subcutaneous absorbents of the thigh perforate, to be received into a gland lying immediately within this part of the canal. These perforations are about fifteen in number, and scarcely observable but by a quicksilver injection; they sometimes enter the sheath within the circumference of a shilling; at other times they do not pass so much in a cluster, some going through between the artery and the vein.

The part of the crural sheath, thus perforated by the absorbents, has been called the *cribriform portion*, and it is this part, which, yielding to the pressure of an intestinal protrusion, is elongated; and forms, with the assistance of a little reticular membrane naturally situated behind it; and also sent forward, the fascia propria of a femoral hernia.

Upon opening the crural sheath; or in other words, cutting away the portion of it formed by the fascia transversalis, we have an opportunity of seeing how the canal is occupied. We observe the inguinal artery placed in the sheath close to its outer boundary; then, that the vein lies nearly in the centre; that there is a partition between the artery and the vein, of fine membraneous substance, and which we have separated from the anterior portion, to obtain this view. We find, moreover, that there is a considerable space left between the iliac vein and the inner boundary of the upper part of the sheath, which is occupied by one or two glands that receive the absorbents from the cribriform portion.

The femoral sheath, as it has been described at the groin, is a clearly marked circumscribed canal; but as it goes down the thigh, it receives processes sent in between the muscles, by the fascia lata; and as it gets past the triceps adductor femoris, it degenerates into a simple sheath to the individual blood vessels, being supplied equally to the arterial and venous branches.

The CRURAL RING, is that part of the mouth of the sheath, seen from the abdomen, being the space between the inguinal vein and the inner edge of the crural arch. This is occupied naturally, by the glands that introduce the absorbents to the pelvis; and from their affording less resistance to the descent of intestine, than the other contents of the sheath, we have the femoral hernia taking its course through the crural ring.

The ANTERIOR CRURAL NERVE, coming from the third and fourth lumbar nerves, and necessarily lying under the fascia iliaca within the pelvis, is not included within the femoral sheath, but passes under the crural arch behind, at the under and outer part of the sheath, to be distributed to the muscles and skin, at the upper and lateral parts of the thigh.

It has been found that inguinal hernia is almost peculiar to the male, and that femoral hernia is of the greatest frequency in the female. Mr. Hey has observed, that in the instances of strangulated internal hernia in females, which have occurred in his practice, the hernia was of the femoral kind. This, however, may not be so much owing to the greater size of the crural ring in the latter, as to the diminutive form of the other inguinal apertures.

As there is considerable difference in the structure of these parts, between the male and the female, I cannot do better than subjoin a measurement, copied from Sir Astley Cooper's Work, which he has described as made up from subjects that appeared well formed, observing also, that "although the precise distance will vary according to the size of the person, yet the relative proportion of the parts will still be preserved."

MEASUREMENT OF THE MALE WITH THE FEMALE PELVIS.

MALE.

	Inches.
Symphysis Pubis to the anterior superior spinous process of the ilium,	5¾
———————— to the tuberosity of the pubis,	1⅛
———————— to the inner margin of the external abdominal ring,	0⅞
———————— to the inner edge of the internal abdominal ring,	3
———————— to the middle of the iliac artery,	3⅛
———————— to the middle of the iliac vein,	2⅝
———————— to the origin of the epigastric artery,	3
———————— to the course of the epigastric artery on the inner side of the internal abdominal ring,	2¾
———————— to the middle of the lunated edge of the fascia lata,	3¾
Anterior edge of the crural arch to the saphena major vein,	1
Symphysis Pubis to the middle of the crural ring,	2¼

FEMALE.

Symphysis Pubis to the anterior superior spinous process of the ilium,	6
———————— to the tuberosity of the pubis,	1⅜
———————— to the inner margin of the external abdominal ring,	1
———————— to the inner edge of the internal abdominal ring,	3¼
———————— to the middle of the iliac artery,	3⅜
———————— to the middle of the iliac vein,	2¾
———————— to the origin of the epigastric artery,	3¼
———————— to the course of the epigastric artery on the inner side of the internal abdominal ring,	2⅞
———————— to the middle of the lunated edge of the fascia lata,	2¾
Anterior edge of the crural arch to the saphena major vein,	1¼
Symphysis Pubis to the middle of the crural ring,	2⅜

SECTION THIRD.

THE PARTS CONNECTED WITH HERNIA, WITHIN THE ABDOMINAL PARIETES.

Peritoneum. This is a firm, though thin semi-transparent membrane of the serous class, lining the cavity of the abdomen, also enveloping the abdominal viscera, and partly covering some of the contents of the pelvis. It is rough and fibrous on its outside, where it is in connexion with the abdominal parietes, but smooth and polished within, being kept moist by an aqueous discharge from the exhalent arteries that open upon its inner surface.

We find three pretty strong chords between it and the fascia transversalis; two of them go downwards, from the umbilicus towards the pubes, and are the remains of the umbilical arteries of the fœtus; the third passes upwards from the navel, and is the relict of the umbilical vein. These vessels degenerating into impervious chords, after birth, from being of no more use, have been denominated *ligaments of the peritoneum.*

The peritoneum behind the groin begins to be very loosely attached at about an inch above poupart's ligament, preparatory to becoming reflected to line the bottom of the abdomen. It is rendered by this circumstance very yielding; and it is not difficult to understand why it should so uniformly be pressed forward in a hernial protrusion; since it is not so much the opposition afforded by the peritoneum at this part that keeps the intestine within the cavity, as the more firm resistance given by the parietes at the groin. Thus, when they yield, the peritoneum, instead of being broken through, is brought down with the gut, and forms to it an immediate covering, called the hernial sac.

This membrane, while within the abdominal cavity, is very sensible, and highly susceptible upon the slightest wound, of erysipelatous inflammation; but after a portion of it has become a hernial sac, it is not so liable: perhaps this is owing to the pressure which that portion of the membrane has undergone; for certainly, after it has become estranged from its natural cavity, it is not so subject to irritative inflammation. Thus we can cut into a hernial sac, for the purpose of relieving its contents, without having the ordinary dread of wounds attending the peritoneum.

Fascia iliaca. From the inner labium of the crista of the ilium, forming an angle with the fascia transversalis, and from the posterior edge of poupart's ligament, a fascia is extended upwards, inwards, and backwards, lying in close connexion with the iliacus internus and psoas muscles, and situated between them and the great vessels that lay by the edge of the psoas magnus. It proceeds upwards under the kidney, and is continuous with the fascia transversalis, lining the diaphragm; it also meets the fascia of the opposite side, over the lumbar vertebræ. It is furthermore, extended over the brim of the pelvis, and becomes attached to the side of the urinary bladder, in a manner to be pointed out, when we come upon the anatomy connected with lithotomy; for from its peculiar attachment at this part, I am of opinion, that some light is to be thrown upon the lateral operation for stone.

The fascia iliaca, as connected with femoral hernia, is remarkable for sending down a process under the femoral vessels, that becomes a bed for the femoral artery and vein, for some way down the thigh; and it is this continuation of the fascia iliaca, which, joining with the process sent down by the fascia transversalis, forms the crural sheath before described.

The fascia iliaca is firmly connected to the iliac portion of poupart's ligament, between the spine of the ilium, and the outer part of the mouth of the sheath, so that a hernia is completely prevented in that direction; and from the inner edge of the crural arch to the symphysis pubis, it is seen as one substance with the fascia transversalis, it then passes down into the cavity of the pelvis, to be attached to the anterior part of the urinary bladder.

The posterior surface of the fascia iliaca, is in contact with the iliacus internus, psoas magnus, and upper part of the anterior crural nerve. Its anterior surface has the peritoneum loosely attached to it by long fibres of reticular membrane;

the iliac vessels are, however, more firmly connected with it. Small superficial branches, from the lumbar nerves, pass through perforations in this fascia, and appear on its upper surface near the crural arch.

EPIGASTRIC ARTERY. The epigastric artery is a part that should be well understood, as in a great measure, it regulates the operation for inguinal hernia.

This vessel arises from the inner side of the external iliac artery, as it is about to pass under the crural arch, and proceeding in a course upwards and inwards towards the umbilicus, anastomoses with the internal mammary. After its origin, it passes up behind the fascia transversalis, between it and the peritoneum, keeping to the inner margin of the internal abdominal ring: at an inch above poupart's ligament, it gets before the fascia transversalis by perforating it obliquely. A little higher up it penetrates the posterior part of the sheath of the rectus, and towards the umbilicus, it enters the substance of that muscle, previous to its joining with the internal mammary artery. The epigastric artery is placed behind the spermatic chord, being crossed by the latter, and runs in an angle, formed by the vas deferens, as it turns round the inner edge of the internal ring, in its passage from the chord to the cavity of the pelvis. The trunk of the artery is about the size of a crow's quill, which is sufficient to make its wound important. After its origin, it gives off a small twig, that goes to the spermatic chord in the oblique canal; and when it arrives within the sheath of the rectus, it distributes lateral branches to the substance of that muscle.

The origin of the epigastric artery is not always from the same source; it has been known to arise from the external pudic artery; also from the arteria profunda femoris. Sometimes, and not unfrequently, it comes from the external iliac, at between nearly one and two inches, up from poupart's ligament; in which case, it takes a course downwards, then a curve forwards and upwards, to pass in its usual direction, and to the inner side of the internal abdominal ring.

Dr. Monro, in his Outlines of Anatomy, speaks of having a specimen, wherein the epigastric artery took its rise from the obdurator and passed upwards and inwards to the rectus muscle.

It has also been said, that in some uncommon instances, the epigastric artery has taken a course along the outer edge of the internal ring. This circumstance is referred to by Dr. Monro and Mr. Lawrence* from the authorities of Sabatier, Camper, Desault, Chopart, and Rougemont. Since I am not aware, however, that this anomaly has ever been witnessed by any British or American anatomist, and not even by Sir Astley Cooper, although alleged by Mr. Lawrence, page 108, of his Work alluded to; I should be inclined to think that the cases spoken of, were instances of the ventro-inguinal hernia, wherein the protrusion had taken place, from immediately behind the external ring; and consequently to the inner side of the epigastric artery, wherein also, in most instances, the chord is situated to the outside of the hernial sac, which would not necessarily be the case, was the artery to take a course along the outer margin of the internal ring, and the hernia of the oblique kind, as hinted to be stated by Rougement, &c.

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* "The situation of this vessel, (the epigastric artery,) in relation to the neck of the hernial sac, is a point on which great variety of opinion has subsisted among surgical writers; this may have arisen in some degree, from the actual variation in the position of the artery; but there can be no doubt, that the chief cause has consisted in the want of a sufficient number of investigations, and particularly of the parts in their altered state. Thus Richter Traitè des Hernies, p. 123.) supposes that the artery is found near the external angle of the ring, in the diseased as well as in the healthy state of parts; and he supports his opinion by stating, that the vessel was divided in the dead subject, by cutting upwards and outwards, and never, by directing the incision towards the linea alba. It is very clear, that these observations can only apply to the healthy state of parts. Camper (Demonst. Anat. Pathol. lib. II. p. 5.) has noticed the change of situation which this vessel undergoes in inguinal hernia: "*In herniis igitur inguinalibus, arteria et vena epigastrica versus pubem a prolapsis intestinis compelluntur.*" Chopart and Desault not only knew the ordinary situation of the artery in bubonocele, but were acquainted with the more uncommon case, in which it is found near the external angle of the ring. "Mess. Chopart et Desault admettent l'artere epigastrique au cotè interne de l'anneau, er rarement au cotè externe dans le cas de hernie." (Rougemont in a note to his translation of Richter, p. 124.) This statement is confirmed by the testimony of Rougemont, (Ib. p. 124.) who adduces his own experience on the subject, and rightly adds, that when the artery is on the outside of the ring, the spermatic chord is situated on the outside of the hernial sac. The variation in the course of the vessel is also rightly stated by Sabatier, (Medicine Operatoire, tom. i. p. 92.) The truth of the opinion entertained by Camper, Desault, Rougemont, and Sabatier, is fully confirmed by the more ample experience and extensive researches of Mr. Cooper, whose excellent work on the anatomy and surgical treatment of inguinal hernia, I have had such frequent occasion to refer to." *Treatise on Hernia* p. 106.

By the reference made to Mr. Lawrence's Work, this peculiar course of the epigastric artery is evidently implied; but from his quotations it does not appear that he has given proof, that such was the observation of the anatomists mentioned. Perhaps if it had been said, in regard to these cases, that instead of the epigastric artery taking an uncommon and extraordinary course, the direction of the bubonocele was not as usual; the fact would have been recorded.

I cannot find any thing in the work of Sir Astley Cooper tending to confirm this extraordinary variety of the epigastric artery; but, on the contrary, what he has said at all, bearing upon the subject, seems to go to prove it a mistake, and to explain the error, by describing a species of hernia, denominated ventro-inguinal.

This artery has been seen to arise from within the crural sheath, an inch down from poupart's ligament, in which case it would be very near the neck of the tumour in femoral hernia, both at its outer and upper part. This artery, when at its usual origin, is drawn into the mouth of the crural sheath, at every time of extension of the thigh.

For its connexions with the obturator artery, see the description of that vessel.

The epigastric artery is always accompanied at its inner side, by one, and often by two veins, which take the same course as the artery, and proceed from the pubic side of the external iliac vein, as it lies under the crural arch.

Arteria circumflexa ilii. This goes off from the outside of the external iliac artery, opposite the epigastric, and immediately below the crural arch. It runs outwards and backwards, in a curved line along the inner labium of the crista of the ilium, lying in a hollow, formed by the junction of the fasciæ iliaca and transversalis. Proceeding along the outer edge of the iliacus internus muscle, it reaches the lumbar spine, where it joins the ileo-lumbar arteries, by small inosculating branches. In its course, it sends off small twigs, and among others, some considerable ones are distributed about the crural arch. Sometimes a very principal branch comes before poupart's ligament, mounts the abdomen, which from taking a course upwards, nearly in the direction of the epigastric, and from being almost of the size of that vessel, has been called the external epigastric.

Obturator artery. This vessel is very irregular in its origin; is ordinarily described, as arising from the internal iliac, but not unfrequently it comes off from the root of the epigastric: its direction through the obturator foramen, however, is invariable; and it is distributed, principally, to the upper part of the triceps muscle of the thigh.

When the obturator arises from the internal iliac artery, it takes a course a little below and nearly parallel to the brim of the pelvis; and, accompanied by the obturator nerve, both pass out the small hole at the upper part of the obturator ligament. In this course it gives branches downwards of considerable size to the neck of the bladder, prostate gland and vesicula seminalis: also upwards to the iliacus internus and psoas muscles, as well as to the lymphatic glands which lie upon them. During such a course the obturator artery is not in the way of the operation for femoral or inguinal hernia; but as it often happens that it has an origin from the external iliac in common with the epigastric artery, it becomes then of more important consideration. I shall devote some little attention to examine its varieties.

In the first place, as there is much valuable information upon the subject of the distribution of the obturator artery contained in the second volume of Dr. Monro's Outlines of Anatomy, commencing at page 90, I shall refer the reader to the foot note for what he says on the subject.* In addition to this statement I have something to offer in regard to the anomalies of this artery. During the last winter, while in Philadelphia, I injected a male adult subject, for the purpose of demonstrating the surgical anatomy of the arteries; when I found on the left side, that the obturator came off by a full sized trunk from the internal iliac at its ordinary place of departure, and proceeded as usual towards the obturator foramen; but, that a branch also arose from the inside of the external iliac just under the crural arch, that took a curved direction over the linea-ileo-pectinea, and united with the former a little behind the hole in the obturator ligament, and forming a common trunk to supply the triceps adductor femoris, &c.

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* The trunk common to the *Obturator* and *Epigastric Arteries*, is sometimes a quarter of an inch in length; in other instances, it measures from an inch to an inch and a half; and I have met with it of all intermediate lengths.

"If the common trunk be only a fourth of an inch long, the *Obturator Artery* runs on that side of the sac which is next to the anterior spinous process of the ilium, and cannot be displaced, being firmly bound down by a cellular substance; and therefore cannot be injured, in that kind of Crural Hernia in which the displaced bowels are lodged within the sheath of the lymphatic vessels, by dividing that part of the crural arch next the pubis, in the manner recommended by Mr. Gimbernat.

"On the other hand, it frequently happens, when the *Obturator* arises in common with the Epigastric Artery, that a third branch nearly of equal size with the obturator, takes its rise from the common trunk. This may be called the artery of the internal part of the crural arch; for it runs on the inner side of the crural arch, passes across Gimbernat's ligament, and, when it reaches the symphysis pubis, then divides into a number of small branches which are distributed upon the inner side of the symphysis pubis.

"It also merits attention, that a small artery, or two or three small branches, are sometimes sent off from the Obturator, in its course from the common trunk to the *Foramen Obturatorium*, which are distributed upon that part of the crural arch called Gimbernat's ligament, and which may be divided in performing the operation for crural hernia, as recommended by Mr. Gimbernat.

"When the trunk common to the *Obturator* and *Epigastric* arteries is of an inch, or an inch and a half in length, the *Obturator Artery* is then situated between the symphysis pubis and the hernial sac, and sometimes follows the same course as that part of the crural arch called Gimbernat's ligament; of which I have seen several examples.

"Mr. James Wardrop is, I believe, the first who has described such a distribution of arteries in the case of crural hernia. In that instance the *Obturator Artery* arose from the same trunk as the *Epigastric Artery*, and then passed on the pubal side of the neck of the hernial sac, and described a semi-circle around the neck of the sac.

"Baron Haller, Lieutaud, Richter, and Murray of Upsal, have described such an unusual origin of the obturator artery, but do not make mention of the proportion of cases in which it occurs.

"I nave paid a good deal of attention to this department of anatomy. In my Observations on Crural Hernia, (published in 1803,) I have stated, that I had not observed such a deviation from the usual distribution of the arteries *in above one of twenty-five or thirty cases;* and according to subsequent observation, such a distribution of arteries occurs in about one of twenty cases. I have also observed, that the short division is as common as the longer; and as the obturator artery is only in danger of being divided by Gimbernat's operation in the latter case, (indeed Mr. Cooper asserts, that he had never met with the obturator artery passing around the neck of the hernial sac,) *hence such an unusual distribution of the obturator artery does not form so material an objection to the operation for crural hernia*, performed according to the method of Gimbernat, as has been supposed.

"There is still another variety as to the distribution *of the Epigastric and Obturator arteries.* These arteries, in some cases, come off from the anterior iliac artery by separate trunks; and *the obturator artery passes around that part of the crural arch called* Gimbernat's *Ligament*, and is attached to it by cellular substance. When this happens, the obturator artery, by the descent of a portion of the intestine through the crural ring, is pressed upon the very part of the crural arch, divided by Gimbernat, in his operation for crural hernia.

"I have seen the obturator artery sent off from the external iliac artery, about an inch and a half above, and in others about an inch below *the epigastric artery;* and in other cases, even on the outer side of the pelvis, from *the superficial Femoral Artery;* in which case, the artery ascends along the pectineus muscle, and enters the pelvis at the crural aperture. The artery in this case is placed behind the crural hernia.

"I have made particular mention of all the varieties as to the origin and course of the obturator and epigastric arteries, and of their branches, which have fallen under my observation; as these arteries are of considerable size, and when divided in the time of performing the operation for crural hernia, have poured out so much blood as has proved fatal; for on account of their deep situation and retraction, it is extremely difficult to secure these by ligature."

Both these vessels were of equal calibre at least, with the obturator artery under ordinary circumstances.

In the instance alluded to, the curvature of the branch passing over the brim of the pelvis, was sufficiently bold to have allowed a femoral hernia to pass under it. The epigastric artery, in this case, came off by a separate trunk, and from the forepart of the iliac artery. Now, if in this man's case, a femoral hernia had existed, which required an operation, this anastmosing branch with the obturator, might have been cut, when nothing short of a ligature around the common iliac, perhaps, would have restrained the hemorrhage. I have had a drawing made from this dissection, which accompanies this part of the work; it may also direct to the situation of some of the arteries within the pelvis.*

On the opposite side in this subject, the same anomaly was seen; but in that, the anastomosing branch came off with the epigastric by a common trunk, and was of less size than on the left side.

Since I had met with this variety, I have been shown a specimen from among the collection of my particular friend, Dr. George M'Clellan, of Philadelphia; but in which the anastomosis was by tender branches connecting the epigastric with the obturator; and, on my arrival here, I have seen another instance of this extraordinary arterial variety in the Museum of Professor Hosack of New-York, prepared among the last winter dissections of Dr. James Anderson, of this city. Here also, it came off in common with the epigastric, and in going over the brim of the pelvis, took a course before the epigastric vein.

Since the time it was first observed, that the obturator artery came off occasionally from the epigastric and external iliac, various have been the proportions of cases in which it was said to occur. In 1803, Dr. Monro mentions to have found it in one out of twenty-five or thirty cases. He is of opinion afterwards, that it occurs in one out of about twenty cases. Mr. Hey supposed it to be found in one instance out of seven; and I am under the impression that in 1810 Sir Astley

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* See Plate V.

Cooper considered it to take place in the proportion of one case in three. Since that period, from my own observation, I am firmly of the belief, that the epigastric or external iliac artery is the more common source of the origin of the obturator. I think, notwithstanding, that in the majority of these instances, a femoral hernia is more likely to lay upon the artery than be insinuated between this vessel and the brim of the pelvis, in its way under the crural arch.

Having now gone through the anatomical structure connected with inguinal and femoral hernia, we will proceed to examine the varieties of these herniæ, and try to account for the morbid appearances found under the different forms of the disease: and moreover, we will recommend such a manner of operating as shall be consistent with the true anatomy of the parts.

CHAPTER IV.

HERNIA.

GENERAL DESCRIPTION OF HERNIÆ.

It is my design in this division of the subject, to confine my observations to inguinal and femoral hernia with their varieties; and only to say so much concerning each species, as shall be closely allied with the anatomical structure. Hence, it will not be expected that I shall enter into a detail of the symptoms and medical treatment of the disease; but I will give such signs of hernia, as shall be reducible to the healthy and morbid anatomy of the parts; and say as much of the diagnosis of ruptures, as may tend to recapitulate the previously described dissections. And moreover, when I come to the operations for the relief of incarcerated intestine, I will try so to arrange the description, that the student may have another opportunity to run over in his mind, the intricate mechanism at the groin.

According to our proposed arrangement then, we will proceed; and designate a Hernia to be, " the protrusion of a viscus, from its proper cavity, attended with tumour;"* and as we are specially to consider the subject,—the escape of some of the abdominal contents either above or below poupart's ligament, producing a swelling at the groin.

Herniæ are named from the situation they occupy. Thus, when occurring above poupart's ligament, we call it an INGUINAL HERNIA, a general term to distinguish it from the escape of intestine, under the crural arch, when it is denominated FEMORAL OF CRURAL HERNIA. There are several species of inguinal hernia, deriving each a name from the situation and particular direction of the tumour; hence, when it passes through the internal ring, it is called OBLIQUE INGUINAL, which, before it makes its exit through the external abdominal aperture, also takes the name of BUBONOCELE; but after it has passed this part, and descended by the chord into the scrotum, it is then called OSCHEOCELE. The DIRECT INGUINAL HERNIA is where the protrusion takes place, from immediately behind the external abdominal ring, having the epigastric artery on its outer side: this also takes the name of oscheocele after it has arrived in the scrotum.

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* Dr. Hosack's Nosology.

Herniæ are moreover, called from the parts contained within the sac. Thus, a hernia, either above or below poupart's ligament, may have within its sac, Intestine alone, or Omentum alone, or may contain portions of both of these parts; in which cases, we have the terms, ENTEROCELE, EPIPLOCELE, and ENTERO-EPIPLOCELE; sometimes the Stomach is in the sac, then GASTROCELE; sometimes the Liver, then HEPATOCELE, if the Bladder, CYSTOCELE, and if the Uterus, HYSTEROCELE.

Except the Duodenum, Pancreas, and Kidneys, which are too cloosely bound down to change their situation; portions of all the different abdominal viscera have occasionally been found within the cavity of a hernial sac.

There is one species of hernia getting its name from the time of its occurrence: this is the HERNIA CONGENITA, as it makes its appearance soon after birth.

SECTION FIRST.

OBLIQUE INGUINAL HERNIA.

THE *Oblique, Common, or Indirect Inguinal Hernia*, has been defined, a tumour with a peritoneal sac, protruding through the internal abdominal ring, in the course of the spermatic chord in the male, or of the round ligament in the female;* and the first form under which we find it is, in the character of a

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* Dr. Hosack's Nosology.

Bubonocele. Having made ourselves acquainted with the relative situation of the parts concerned with hernia, it will be now no difficult matter to follow the progress of a protrusion at the internal abdominal ring.

We have found that this ring is of an oval shape, with its longest diameter placed perpendicularly upwards from poupart's ligament, about midway from the tuberosity of the pubis, and spine of the ilium. That the epigastric artery is running always behind its inner edge, and that the artery is crossed by the spermatic chord, which from the course it takes, occupies invariably the portion of the opening towards the pubes; the chord also from the weight of the testicle is drawn down to the lower part of the ring, and then in the oblique canal, gets support from poupart's ligament. Thus we have seen, that the chord does not occupy the whole of the internal abdominal aperture, yet it is received into a cylindrical membraneous process that goes off from the edges of the internal ring, for the whole of its circumference; and we know moreover, that, in this is not embraced the cremaster muscle. The fibres of this muscle arise from poupart's ligament nearer the ilium than the ring, and though they follow the chord, lay close upon poupart's ligament, and do not begin to expand and be attached to the chord, until they come opposite the lower aperture. Now an intestine protruding before it the peritoneum, finds its way through the internal abdominal ring, necessarily above, and to the outer side of the chord, but not without the sheath of the chord, for an obvious reason. This sheath then, with the other parietes of the oblique canal, directs the gut and its peritoneal covering down the course of the chord; and until it makes its exit through the external abdominal ring, it is known by the name of a bubonocele.

In this form of hernia, the cremaster muscle is not disturbed, but rests still on poupart's ligament at the lower part of the tumour. The chord lies also, in its natural situation, keeping to the inner edge of the ring, consequently, behind and to the lower part of the hernia; but the cylindrical process sent off by the fascia transversalis is expanded and thickened by the hernial pressure, and forms to the bubonocele, a considerable covering.

Thus we have a bubonocele complete, and we see it in the living subject, occupying the space above poupart's ligament, and between the situation of the two abdominal apertures.

The coverings to this hernia, are first common integuments, then superficial fascia, afterwards the tendon of the external oblique muscle, then the membraneous covering of the chord, much expanded and thickened, and lastly, the peritoneal sac. The shape of the tumour resembles an egg; and if it enlarges much before it passes the external ring, the increase is seen all to be made above poupart's ligament. This protrusion has only to be extended, to constitute the

Oscheocele, or Scrotal Hernia. I have already reminded the reader, that the cremaster muscle is not attached to the chord, while in the oblique canal; and I may also recall to his recollection, that the cylindrical process of fascia covering the chord, from the upper abdominal aperture, was said to be lost upon the tunica vaginalis, soon after it had passed the external ring; but not before the cremaster muscle had begun to have connexion with the chord and to be spread mostly around it. Thus the bubonocele, as has been before stated; has its course directed by this cylindrical process of fascia as far as the external ring; and as it is about to change its name for Oscheocele, is further piloted as it descends into the scrotum, by the cremaster muscle. The duty of conducting the hernia, now becomes transferred from the membraneous process to the muscle in question; and so faithfully does the cremaster fill this office, that we find, rather than leave its post, it becomes thick, broad, and firm in proportion to the duration and size of the scrotal hernia.

In the progress of the hernia into the scrotum, it advances before the chord between it and the cremaster muscle, which is constantly kept before the tumour in the ordinary form of the disease.

It has been stated, while on the anatomy of these parts, that the cremaster muscle was immediately covered by a process of the superficial fascia that descended along the chord, after having been in close adhesion with the edges of the external abdominal ring; this also becomes greatly expanded and thickened in scrotal hernia, and from the same cause which added to the growth of the cremaster muscle, as previously alluded to, this also becomes a formidable covering to the oscheocele.

The coverings to the oblique inguinal hernia in the scrotum then, are; after the common integuments, those made by the superficial fascia, cremaster muscle, and lastly the peritoneal sac.

THE VARIETIES OF THE OBLIQUE INGUINAL HERNIA.

Sometimes, after the protrusion has commenced at the upper abdominal aperture, and has began to proceed down the oblique canal, from some cause or other the tumour gets over and behind the spermatic chord, although still within the cylindrical process sent from the internal ring; and in this direction descends into the scrotum. Instances of this kind have been said to exist, and it can be imagined that they may take place. Now if they should occur, there will be some difficulty attending a diagnosis between this variety and the ventro-inguinal hernia. It will be stated, when we come to that species, that its principal peculiarity, in reference to determining the nature of the disease before an operation is, that the spermatic chord will be found placed on the forepart of the tumour, that there is no alteration in the cremaster muscle, and that it does not become a covering to the hernia. Thus, in the variety we have mentioned, the protrusion does not proceed to insinuate itself between the cremaster muscle and the tunica vaginalis, but has the whole chord bodily before it together with its envelopement afforded by the superficial fascia. This variety, therefore, we would have much difficulty to distinguish from the direct inguinal hernia; and we would be proportionately undecided in what direction to divide the stricture, that we might avoid cutting the epigastric artery.

These instances, however, must not have been many, since they are not recorded by Sir Astley Cooper, as having come under his own observation; nor do I remember that he had met with a case up to the time when I attended his lectures in 1810.

There is another form in which the oblique inguinal hernia sometimes appears: this is, in which the vessels of the chord are found separated from one another by the protrusion coming down among them, so that the vas deferens may be on the forepart of the hernia, the spermatic artery behind, and the spermatic veins perhaps one on each side. Thus we have an intricate case, in which, if necessary, to be operated upon, much caution and judgment will be required at the hands of the surgeon. I cannot explain why this variety should happen, otherwise than by imagining that the tunica vaginalis of the chord might have remained imperfectly closed at its upper part, after birth; so that the intestine might have been invited into it, and then, by meeting resistance a little way from the ring, the vessels of the chord might in consequence be separated; or, the circumstance of the particular direction of the force, causing the protrusion of a portion of the tunica vaginalis at its upper part, to assist in forming the hernial sac, in which case, the vessels of the chord might have been deprived of this covering.

SECTION SECOND.

DIRECT, OR VENTRO-INGUINAL HERNIA.

Sometimes, and not unfrequently, hernial protrusion takes place from immediately behind the external abdominal ring; in which case it comes under the tendon of the internal oblique and transversalis muscles, or through some of their fibres; to the outer edge of the lower part of the rectus muscle, and above that portion of the tendon of the external oblique, which comes from the opposite side to be attached to the crest of the pubis, as far as the tuberosity.

The fascia transversalis might be protruded with the tumour, and form a covering immediately over the hernial sac, since it lines that part of the parietes from which this hernia advances; but perhaps it is more frequently broken through; as this species is of more sudden occurrence than the oblique form: being generally produced by a fall or blow, to which the person having the disease can readily refer. It does not take place perhaps so much, from the parietes of the abdomen behind the external ring being weaker in the individual than they are at the upper aperture; but, because it had so happened, that in the particular instance, the force producing the rupture was directed to that spot, instead of the part opposite the internal ring.

This hernia is not of such gradual growth as the oblique form, neither does it arrive at so large a size before it becomes strangulated; these circumstances are owing to a sudden force being required to produce it, and from the parts about its neck being less dilatable.

The great peculiarity in this form of hernia is, that the epigastric artery is always on the outer side of the neck of the hernial sac, while in the oblique form, it is invariably to the inner side.

By reflecting a moment upon the structure of parts about the neck of the tumour in ventro-inguinal hernia, we will find, that it is almost surrounded with a fibrous texture, that will, before the hernia has become very large, produce stricture and strangulation. In the first place, if it has perforated between the fibres of the tendon of the transversalis, it becomes immediately surrounded by a firm band, which, in every action of that muscle, will produce constriction; and if this has not been the case, it is nevertheless pressed down by the lower edge of that tendon, upon the sharp border of the tendon of the external oblique, coming from the opposite side, and placed under the neck of the hernial tumour; and it is further made stationary to undergo this pressure, by the resistance made by the upper and outer boundary of the external abdominal ring. By considering these sources of stricture in this form of hernia, we shall be able to follow the directions prescribed for operating, when we come to that part of the subject.

This hernia, as it passes out of the external ring, pushes before it the superficial fascia, but does not disturb the spermatic chord. Thus we always find the spermatic chord lying to the outer and under part of the tumour.

The appearance of this tumour is different from the other kind of inguinal hernia, it is situated nearer the penis, the upper part of it does not appear to take the oblique course that is seen in the other form of the disease, and as well as the tumour generally being smaller, it is much less in size about the external abdominal ring than the oblique hernia.

The coverings to the ventro-inguinal hernia, are after the common integuments, the superficial fascia, and lastly, hernial sac; in cases where there is no portion of the fascia transversalis protruded.

This form of inguinal hernia appears to have been first noticed by Camper, in 1759. And before the fascia transversalis and its opening, the internal ring, were demonstrated by Sir Astley Cooper, together with the relative situation of the epigastric artery thereto; there is no difficulty in conceiving why the epigastric artery should have been thought to have varied in its course, while it was the hernia which did not take its usual direction. Mr. Cline saw his first case of ventro-inguinal hernia in 1777, in the instance of a Chelsea pensioner, since which time Sir Astley Cooper has recorded several cases that have come under his own observation.

SECTION THIRD.

CONGENITAL HERNIA.

Hernia Congenita, or Hernia Tunica Vaginalis Testis, is a species of hernia almost peculiar to the fœtal state; it is derived from pressure upon the abdominal contents, causing a prolapsus of intestine within the cavity of the Tunica Vaginalis; into which situation it is invited because the cavity of the Tunica Vaginalis of the chord, has remained open. Hence we find that the bowel does not protrude before it a process of peritoneum; but in this form of the disease the Tunica Vaginalis becomes the hernial sac. The tumour in this species of hernia is always formed of intestine, as the omentum is too short at this period of life to form any part of it; and from this circumstance it is called by nurses the *Windy rupture*.

Hernia Congenita, however, does not always appear at an early age, for sometimes at middle life, and even at an advanced period, we have this form of disease, which, though it cannot literally be said to be a hernia congenita, is virtually so.

from partaking of the same anatomical structure as we find it in the infant. This is because the tunica vaginalis of the chord has remained open; but yet a cause for rupture had not been applied until a long time after birth.

The congenital hernia necessarily takes the course of the spermatic chord, but it has the spermatic vessels and vas deferens behind it. From being within the cavity of the tunica vaginalis, it has its neck very close to the epigastric artery. As it descends into the scrotum, by enlarging the reflected portion of the tunica vaginalis, it proportionately expands the cremaster muscle and its aponeurosis.

The coverings then, to the hernia congenita, are the same as to the bubonocele and oscheocele, with this difference, that in the former, in the place of a peritoneal sac, we have the reflected portion of the tunica vaginalis.

VARIETIES OF CONGENITAL HERNIA.

There is a variety in this form of the disease, in which the tunica vaginalis being closed at its upper part, having the rest of its canal remaining open; the intestinal protrusion is pushing before it a hernial sac; which becomes elongated into the cavity of the tunica vaginalis. This, Sir Astley Cooper thinks may be called an encysted hernia of the tunica vaginalis; which name would be the more correct, since the sac, instead of being formed by an elongation of peritoneum, is rather an extension perhaps of the adhesion that has taken place within the cavity of the tunica vaginalis, opposite the abdominal aperture.

In the Surgical Observations of the late William Hey, of Leeds, is minutely detailed a description of this uncommon species of hernia, which, for the benefit of my readers, I shall here transcribe.[*]

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[*] I examined the body of a child, fifteen months old, who had died of a *strangulated scrotal hernia,* in the presence of Dr. Crowther, a physician who then lived at Leeds.

The intestines were not much inflamed, but had, in general, their natural appearance. The jejunum and ilium were considerably inflated with air, but the colon was so much contracted, that it looked like a solid chord, rather than hollow intestine. The cæcum, or head of the colon, was not to be seen in the abdomen, for it had descended through the abdominal ring, which formed a stricture upon that part of the intestine where the ileon forms it. In the stricture also, was included the root of the appendicula vermiformis, the rest of this appendage being still in the abdomen.

I shall conclude this article by copying a case communicated by Mr. Thomson Forster, Senior Surgeon to Guy's Hospital, to Sir Astley Cooper; and contained in the First Part of his Work upon the Surgical Anatomy of Hernia. This case differs from the one recorded by Mr. Hey, inasmuch as the patient in Mr. Forster's case, was in advanced life; the quotation also, is the more valuable, since it has added to it, Sir Astley's opinion of the formation of this peculiar variety of congenital hernia.*

Having examined the contents of the abdomen, without altering the state of the hernia, I made a longitudinal division of the scrotum on its right side; continuing my incision the whole length of the tumour, and laid bare, as I imagined, the hernial sac. This I opened, towards its inferior part, which was the most prominent, but it proved to be the *tunica vaginalis testis,* containing, together with the testicle, a portion of the true hernial sac.

This unusual appearance engaged me to prosecute the dissection with great care. I found that the tunica vaginalis was continued up to the abdominal ring, and enclosed the hernial sac; adhering to that sac, by a loose cellular substance, from the ring to within half an inch of its inferior extremity. The fibres of the cremaster muscle were evident upon the outside of the exterior sac, or tunica vaginalis. The interior, or true hernial sac, was a production of the peritoneum, as usual, and contained only the cæcum or head of the colon. The strangulated part of the intestine appeared to have been much inflamed, and was in some places become black; it was considerably distended, and, was filled with liquid fæces. Having removed the proper hernial sac, I examined the posterior part of the exterior sac, and found it connected with the spermatic vessels in the same manner as the *tunica vaginalis* is, when the testis has descended into the scrotum. An additional proof, that the exterior sac was the tunica vaginalis.

From all these circumstances it is evident, that this hernia differed both from the common scrotal rupture, in which the hernial sac lies on the outside of the tunica vaginalis, and also from the *hernia congenita,* where the prolapsed part comes into contact with the testicle, having no other hernial sac besides the tunica vaginalis.

* Wm. Chadwick, a shoemaker aged 31 years, of spare habit, was admitted into Guy's Hospital, on the 31st January, 1801. He complained of great pain in his right groin, which was tense and painful to the touch, he had great anxiety of countenance, singultus, and subsultus tendinum. I learnt that thirty-six hours previous to his admission into the hospital, during a fit of coughing, he was seized with an acute pain in the groin, and, on examination, I discovered a small tumour just below the abdominal ring, and extending about three inches into the scrotum. I adopted every plan my experience could suggest, for the reduction of this tumour, but all my efforts proved fruitless, and as the symptoms were of the most urgent nature, and the life of my patient in such imminent danger, I considered any further delay as improper, and proposed an operation as being the only probable means of saving his life. To this, however, he objected, and he died on the following day.

On dissection, the following were the appearances. When the scrotum was divided, the tumour was brought in view, taking the course of the spermatic chord, evidently involved with it, and much contracted at the ring. On investigating further, and cutting carefully through the tunica vaginalis of the chord near the ring, a fluid escaped. I then continued the incision to the bottom of the scrotum, through the tunica vaginalis of the chord and the tunica vaginalis testis, which I now found to be one cavity, the edges of which being turned back on either side, exposed a hernial sac, pended from the ring, and descending towards the testicle.

From hence it evidently appeared, that the hernial sac and its contents were contained in the tunica vaginalis of the spermatic chord, which formed only one cavity from the ring. On opening the hernial sac, it was found to contain a portion of small intestine, of a claret colour, and in a mortified state.

SECTION FOURTH.

FEMORAL HERNIA.

I WOULD require of the reader that he recollect what has been said of the anatomy of the crural arch, by which he will be better able to understand the peculiarities of this form of hernia; and he will know why this hernia does not become so large as inguinal hernia; and moreover, why it is oftener strangulated than that form, and furthermore, why there is less hope to be entertained for its reduction by the taxis.

When there is, from some cause or other, resistance made to a hernial protrusion by the parietes above poupart's ligament, the place at which it finds the most ready exit, is at the crural ring. This we have before mentioned to be bounded on the outside by the femoral vein, and on the inside by the inner edge of the crural arch attached to the crest of the pubis. This space being naturally occupied by one or two glands receiving the superficial absorbents of the thigh, after they have perforated the side of the crural sheath. The intestine carrying down with it a portion of peritoneum into the mouth of the crural sheath, dislodges these glands; for the other contents of the sheath are too firmly fixed to be disturbed; then pushing down before it the reticular membrane which connected these glands to their natural situation, the force is directed against the side of the sheath itself; now the cribriform portion of the crural sheath being the weakest part of that canal, yields to the hernial pressure, but is not broken through. The reticular membrane brought down before the hernial tumour, becomes by the continuance of the

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"The idea which I have formed of the nature of this case is, that the tunica vaginalis, after the descent of the testis became closed opposite the abdominal ring, but remained open above and below it. That the intestine descended into the upper part, and elongated both the adhesion and tunica vaginalis, so as to form it into a bag, which descended into the tunica vaginalis, below the adhesion, and becoming narrow at its neck, though wide at its fundus. It received a portion of intestine, which was too large either to be returned into the abdomen, or to retain its functions whilst it continued in the sac.

This disease does not appear like a hernia of the tunica vaginalis, as the testis is not involved in it, but can be distinctly perceived below it. Some embarrassment will be produced in the operation, if the surgeon does not open the tunica vaginalis very freely, so as completely to expose the parts. The strangulation arises from the contracted state of the mouth of the hernial sac, which may be very safely divided upwards.—*Cooper on Hernia.*

pressure, consolidated with the cribriform portion of the sheath, until between the two, we have a formidable covering to the hernia, which has been called the *Fascia Propria* of a femoral rupture.

As the protrusion advances, a small tumour begins to be evident at the upper and inner part of the thigh, a little below poupart's ligament, on the part at which the absorbents enter the crural sheath. And after it has proceeded well out of the sheath, the tumour seems to increase in size by coming forward, and not by going down the thigh or rising upwards, the common integuments and superficial fascia being more loosely connected just at this part. When, however, it has acquired the size of a lime, it begins to rise upwards, and to be seated over the ligament of Poupart, making a tumour in the groin, nearly in the situation and of the appearance, of a bubonocele, which it almost completely resembles, from assuming an oblong shape by a lateral increase, as it advances in size.

A Femoral Hernia seldom arrives at a very large growth; the size of an egg is generally that, at which it becomes strangulated, and the largest size which it reaches, is scarcely beyond that of the fist: yet there is one mentioned by Dr. Thompson, the late Professor of Military Surgery, at Edinburgh, in the case of a woman who laboured under an old irreducible crural hernia, in whom the tumour extended half way down the thigh; in which case the parietes of the abdomen were so thin that the peristaltic motion of the intestine could be distinctly perceived. Notwithstanding all this, the crural hernial tumour is comparatively much smaller than the inguinal; which is owing to a cause, that also renders it more dangerous.

The coverings to a femoral hernia are, after the common integuments are removed; first the superficial fascia, which, though delicate and thin in its natural state, comes under view now, much thickened and condensed, and withal very distinct. This covering does not embrace the tumour about its neck, but is seen generally spread over its anterior surface, after the manner in which it covers the inguinal glands. When this is dissected back, we come upon the next tunic which is the fascia propria. This gives the precise shape of the tumour, as it derives its form from the hernial pressure; from the beginning of the disease the fascia propria is thick from two causes: first from the increase of growth derived from the duration of the hernia; and secondly, from the additional substance consolidated with it, and found within the crural sheath. When we divide this, there is more or less of the reticular membrane that has not been concerned in forming the fascia propria; this is laying loosely between this tunic and the peritoneal sac, which last we see distinctly, after we have cleared that away with the handle of the knife. The peritoneal sac then is the last covering to the femoral hernia.

We may state that the neck of this hernia has the epigastric artery and vein, which arise from the inguinal vessels, just under the crural arch; running up to its outer side; and when the obturator artery comes off from the epigastric or external iliac, it is either lying under the neck of the hernia, or runs over it and comes down its inner side, at a very little distance from the posterior surface of the crural arch. But more of this when we come to speak of the operation.

There is a measurement which I think fit to subjoin here, relative to the proportionate distances of the parts concerned in femoral hernia; and which I have extracted from Sir Astley Cooper's Work on Crural Hernia.

MALE.

	Inches.
From the pubis to the centre of the orifice of the sac,	2
—— the centre of the orifice of the sac to the external iliac artery,	1
—— the centre of the orifice of the sac to the centre of the external iliac vein,	0½
—— the centre of the orifice of the sac to the origin of the epigastric artery,	0¼
—— the centre of the orifice of the sac to the inner edge of external abdominal ring,	1
—— the tuberosity of the pubis to the centre of orifice of the crural hernia,	1

FEMALE.

Each measure is from one-eighth to one-fourth of an inch more where the pelvis is large and well formed.

THE VARIETIES OF FEMORAL HERNIA.

There are varieties sometimes occurring in femoral hernia, which, though not common, should be mentioned, in order that the surgeon might be able to withstand every difficulty he might meet with during an operation.

It has happened after the hernia has taken place, and the fascia propria formed, that the superficial fascia over the tumour has given way, so that one portion of the tumour was allowed to advance without a covering of the superficial fascia, while the remainder of it was retained under that fascia, and in this way became divided into two lobes, having the appearance of an hour-glass contraction; the edge of the fascia superficialis splitting the tumour. Now this, if of long duration, might be the cause of stricture, and produce the symptoms of strangulation, on what otherwise might have been a reducible femoral hernia: or, if this peculiarity was only of recent occurrence, in a femoral hernia that required to be operated upon for a stricture at the crural arch; by dividing the superficial fascia, the tumour would resume its usual appearance, and no difficulty be experienced for the rest of the operation. Sir Astley Cooper records a case wherein this variety was found to exist, and which I shall lay before my reader.* Although the detail contains more matter than has immediate reference to the variety in question, yet I shall transcribe the whole of it, as it will serve as a document to be consulted when on the operations.

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[*] Mrs. Sheffield, a patient of Mr. Weston, surgeon at Shoreditch, had long laboured under a large crural hernia, which became strangulated on the 28th Nov. 1804. The symptoms had continued for seven days, and did not appear sufficiently urgent to justify an operation; but on the eighth day, the vomiting becoming more frequent, I was sent for at eleven o'clock at night; and, finding the hernia large and irreducible, I immediately proceeded to the operation.

I first made an incision downwards, at right angles with the crural arch, beginning opposite the middle of the upper part of the tumour, and extending it to its fundus, and another at right angles with the first, in the direction of the longer axis of the tumour, so that the united incisions were of the form of the letter T inverted.

This exposed a portion of the tumour which had projected through a hole on the superficial fascia of the thigh, and which had been burst by the pressure of the hernial swelling. I next opened the anterior part of the sac, and exposed a large portion of omentum, behind which was placed a fold of intestine, much less discoloured than I have

There is another variety of crural hernia, in which the gut and peritoneal sac, instead of pushing forward the cribriform portion of the crural sheath, passes down the sheath, insinuating for the length of from two to three inches, to the side and forepart of the femoral vein. Sir Astley Cooper thinks that this is by no means an unfrequent variety; and states of having found it three times, in the dead subject; wherein it existed at both sides, in each. He considers this species of hernia easily reducible, and thinks that it is not often strangulated, because the mouth of the sac is generally of considerable size in these cases. I should suppose, also, that it was less frequently strictured, on account of its having a straight course down the thigh, and from not taking the curve of the common form of femoral hernia.

A third variety of femoral hernia is wherein the displaced bowel, with its peritoneal covering, enters the crural sheath, and a part of it pushes against the cribriform portion of the sheath, as in the common way, and becomes placed over the pectinalis muscle, being covered by its fascia propria; while the rest of the hernial tumour descends down the sheath, as in the preceding variety, and either continues to the inner side of the femoral vein, or gets before the vein, and sometimes over the artery.

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seen it in other cases, in forty-eight hours after the commencement of strangulation. Next passing my finger into the sac, I found that it was divided into two cavities; the anterior was separated from the posterior part, by a sort of hour-glass contraction, which was formed by the aperture on the superficial fascia. I therefore passed a director into this opening, and divided the superficial fascia upwards, and afterwards did the same below. The hernial sac was next completely opened below the crural aperture. Passing my finger into the hernial sac to its orifice at the crural sheath, I divided the sheath upwards, and then pressing upon the intestine, attempted to return it into the abdomen, but found that it would not pass. I again introduced my finger, and felt the posterior edge of the crural arch pressing upon the mouth of the sac. The probe pointed bistoury I have recommended, was carried upon my finger under this edge, and without the sac, and this portion of tendon cut obliquely inwards and upwards. The intestine was next drawn down, to examine if it had suffered much at the strictured part; and finding that it had not, it was returned into the cavity of the abdomen, having first gently pressed upon it, to evacuate its contents into the portion of the intestine above the stricture.

As the omentum, of which a large portion had descended, adhered to the inner part of the sac, I cut it away, and it was found by Mr. Weston to weigh two ounces aud six drachms. I made pressure on the vessel, and left the divided surface of the omentum at the orifice of the hernial sac; after which, the edges of the wound were brought together by adhesive plaster. On the following day she was free from pain, the vomiting had ceased, and she had two stools. Her recovery, however, was rendered slow, by a portion of integument which had been extremely thin over the sac prior to the operation, having turned livid, and sloughed away. A poultice was applied, healthy granulations arose from the surface of the omentum, and the cure was completed in six weeks.

A fourth variety in femoral hernia, is wherein there is no fascia propria afforded by the side of the sheath of the femoral vessels, as a covering to the hernial tumour. In this case, the side of the sheath gives way; two or more of the holes in the cribriform portion of the sheath, are formed into one, through which the hernia, covered by peritoneum, passes. The peritoneal sac, then, lies immediately upon the pubal portion of the fascia lata, and has going over it, the fascia superficialis. In these cases, in consequence of the want of the fascia propria, the tumour is less firm, and the contents of the sac can be more easily felt, and it has been said that the vermicular contraction of the protruded intestine, in some of these instances, is visible.

A fifth variety has been remarked, wherein the tumour, after getting without the canal of the crural sheath, a portion of it has insinuated under the iliac side of the fascia lata, between it and the anterior surface of the femoral sheath; in which situation the sharp edge of the falciform process of the fascia lata was divided the tumour into two lobes, and become the ultimate seat of stricture.

Another variety of femoral hernia has been stated to be in cases wherein the intestine covered by peritoneum descends the sheath between the inguinal artery and vein, finding its way, through holes in the sheath, just under the falciform process of the fascia lata, through which it also passes, by one, two, or three openings, and appears on the forepart of the thigh, bearing a very strong resemblance to enlarged inguinal glands. The tumour is in a great measure immoveable, and is soon strangulated. "A central flaccidity, or elasticity in the tumour, derived from the contents of the displaced portion of intestine, is the chief circumstance which characterizes this variety of crural hernia."*

The last variety of which I shall speak, is in reference to those cases connected with a peculiar course of the obturator artery. And, to elucidate this, I shall copy Dr. Barcley's case, transmitted to Sir Astley Cooper, previous to 1807, and recorded in the second part of the Surgical Anatomy on Hernia, p. 21. "This preparation, (which Dr. Barcley was so kind as to send me for my inspection, from Edinburgh,) was taken from the body of a young woman, whose history was unknown.

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* Monro's Outlines of Anatomy.

"On examining the situation of the hernial sac, it was found taking its common course, under the crural arch, and situated as usual, on the upper part of the thigh. But, on examining the neck of the sac, it was observed that the epigastric and obturator arteries, had arisen by a common trunk, and that they had passed anterior to the sac, before they divided; after which, the epigastric artery proceeded upwards to the rectus muscle, and the obturator artery passed backwards on the inner side, and close to the neck of the sac, to the obturator foramen through which it usually passes. The obturator artery, indeed, very frequently deviates from its natural course, and instead of arising separately from the internal iliac artery, it derives its origin from the external iliac in common with the epigastric. But in all the cases which I have myself dissected, where this variety existed with crural hernia, the obturator has passed into the pelvis on the outer side of the neck of the sac, entirely out of the reach of any injury by the knife. In twenty-one preparations of crural hernia, I found six out of the twenty-one had this variety in the origin of the obturator artery.* When, therefore, this artery passes before the sac, (as in the case observed by Dr. Barcley,) the arterial trunk common to it, and to the epigastric, is of unusual length; for when the trunk is short, the obturator passes behind the sac. A hernia thus situated, is surrounded by blood vessels, except at its posterior part; which might seem to render it adviseable to deviate from the usual mode of operation, to prevent this blood vessel from being wounded. This, however, is not so liable to happen where the division of the stricture is made upwards, or a little upwards and inwards; for, it will be found that the greatest distance between the artery and the hernial sac, is at its anterior part. It is impossible to feel this artery before the introduction of the knife, for the finger cannot be passed behind the posterior edge of the crural arch, beyond which this artery is placed, until the stricture has been divided. The sac therefore, is to be carefully divided anteriorly; but even supposing the artery to be wounded in the operation, it may be asked, what other direction of the wound would afford greater facility of tying the bleeding vessel? For, by slitting up the crural arch, and drawing down the mouth of the hernial sac, the vessel would be brought into view, and might be secured."

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* "The obturator artery arises more frequently from the epigastric than I have here mentioned, but is found to do so in less proportion in crural hernia, because this situation of the artery has some tendency to prevent a protrusion by passing over the crural aperture."—*Cooper.*

By the remarks attending the case of Dr. Barcley, it will be seen that the hernia is more likely to have the obturator artery on the outer side, and under its neck, than going around it in passing over the brim of the pelvis; consequently, although this origin of the obturator artery is by no means uncommon; yet the chance is not great of its being in the way of the knife. Nevertheless, it is the duty of the surgeon, to be always prepared to meet accidents; and, in the instance of dividing the stricture of a femoral hernia, to proceed as if the obturator artery was always around the neck of the tumour.

SECTION FIFTH.

HERNIA IN THE FEMALE.

We find some difference in regard to the relative size and situation of the parts connected with inguinal and femoral hernia, between the male and the female subject; from which circumstance, as we shall see immediately, the proportionate frequency of occurrence of the several species of this disease will vary in the two sexes.

Although in females we meet with an internal abdominal ring, yet that opening in them, is of less diameter, by reason of the round ligament of the uterus being the only part passing through it. This substance is not one quarter the bulk and thickness of the spermatic chord; from which may be judged the relative size of the upper abdominal aperture in the female.

The greater strength of the abdominal parietes is not altogether owing, however, to the smaller size of the ring in the female: we find, moreover, that the edges of the internal oblique and transversalis muscles, are allowed to come down lower than they do in the male, in consequence of the round ligament of the uterus occupying less of the oblique canal than the spermatic chord. And we see that these muscles arise from poupart's ligament, for one half its length from the spine of the ilium, in the female; while, in the male, they are attached to it for only one third the distance between the ilium and pubis. We find from this, that inguinal hernia in women is of comparatively rare occurrence; and this would be the case even was there no difference in the relative size of the parts at the crural aperture.

The fascia transversalis, at the internal ring, is sending off a similar cylindrical process in the female, to accompany the round ligament, as it does in the male to invest the spermatic chord. Hence we find sometimes in the female child at birth, something analagous to the congenital hernia of the other sex, from a protrusion of gut taking place at the internal ring, before the parietes are sufficiently consolidated; and which passes down the oblique canal, being invited into that situation by this cylindrical process.*

Inguinal hernia in the female, may occur in the oblique or in the direct form. When of the oblique species, we find, while as a bubonocele, that it is situated in the oblique canal before the round ligament, but within the cylindrical process from the fascia transversalis; so that this is to be expected to be met with as a covering to the bubonocele in the female. After the hernia has advanced through the external ring, it becomes situated in the labium pudendum; where the hernial sac is only covered by common integuments, and the superficial fascia proceeding from the external abdominal ring.

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* Infants of the female sex may be afflicted with a species of hernia congenita, as a canal, formed by peritoneum passes through the spermatic ring. This canal is about half an inch in length, and ends in a cul de sac. Vide Nuck Adenographia. Dr. Camper informs us, that he found this canal open in 3 of 14 female infants after birth; and he adds that he had discovered traces of that canal in women who died during delivery. Vide Acad. Haarlem. tom. vi. and vii.—*Monro on Crural Hernia.*

The epigastric artery in the female subject has the same invariable course as in the male, and is crossed in the same manner by the round ligament of the uterus, as it is in the male by the spermatic chord.

When the inguinal hernia of the female is of the direct kind, it proceeds, and is lodged in the labium pudendum, from immediately behind the external ring; it has the same coverings here as when oblique, but is of different diagnosis, since we have nothing like the vas deferens of the chord which we can feel to the outer and anterior part of the tumour, as we have in the male subject, and which is of eminent assistance to us in discriminating the species. To know the fact, however, is equally important as in the other case, since it is to direct our incision for the relief of the stricture, in such a manner, that we may avoid wounding the epigastric artery.

The space under the crural arch in the female subject, is perhaps a little greater than it is in the male; but this is not required, because there are sizeable parts passing through; but if it is the case, it is because of the greater width between pubis and ilium, in the female. If the crural arch was bounded above, only, by the ligament of Poupart, it could readily be imagined that the crural ring would be much more extensive in the female subject. Since, however, this is not the case, from their being a separate ligamentous boundary prescribing limits to the mouth of the crural sheath, and which has been specially denominated the crural arch; I am not inclined to believe that the comparative frequency of femoral hernia in women is so much owing to the greater diameter of the crural ring, as it is to the circumstance of the abdominal contents having less opportunity to escape above poupart's ligament.

Femoral hernia in the female is liable to all the varieties that are to be met with in the male; and from the difference of sex affording no difference of structure in the two cases; the same coverings to the peritoneal sac in both instances, are found during the progress of the operation.

CHAPTER V.

THE GENERAL DIAGNOSIS OF HERNIA.

There are diseases occasionally taking place at the groin, with which hernia, either inguinal or femoral, may be confounded. Men of no inconsiderable reputation as surgeons, have found it difficult at times to distinguish between some of these maladies, as also to hesitate whether what they saw and felt was a hernia or not. And we see instances daily in the lower ranks of the profession, wherein trusses are applied to hydrocele, swelled testicle, &c. to the great injury of the patient; evincing the mind of the practitioner more to be taken up in effecting a sale for that article, than in making himself acquainted with the nature of the disease to which it is exclusively applicable. Our professional reputation, and the duty we owe to those who may apply to us for relief, therefore, make it necessary that we direct our attention a little to this point.

A predisposition to hernia is marked by a sense of constant uneasiness, and a feeling of pressure at the groin, increased by exercise or coughing; with the sensation being distinguishable by the application of the hand to the part, and the whole occurring in a person of a relaxed habit of body.

The symptoms which denote the nature of this disease, are, first, the existence of a tumour in the groin, which has been of sudden appearance; and the circumstance of the swelling seeming to be seated above or below poupart's ligament, as the patient is either male or female, will lead to a suspicion that it is a rupture.

After this, we are led to a certainty as to the existence of hernia, by examining into the sensible characters of the tumour : but the information derived from this source, will vary according to the nature of the contents of the hernial sac.

When hernia is present, the tumour will sometimes disappear in the recumbent, and resume its situation when the patient is again in the erect posture. If this, however, should not be the case at the time of examination, the patient may refer to a period when it was so,* and he will be also able to state, that the tumour had commenced its growth at the groin. It will be expected to diminish, when the patient holds his breath, to disappear entirely by means of pressure, and to enlarge again when the pressure is removed;—to be larger and more tense after a full meal, or when the patient is troubled with wind; and soft and small in the morning, before he has taken food. If before the existence of this disease, the patient had been liable to cramps, spasms, constipations, vomitings, or colicky pains; after a hernia has made its appearance, these affections are expected to be increased; and indeed, the presence of one or more of them in a slight degree, may be enumerated among the symptoms of hernial protrusion.

When the tumour is made up of intestine alone, it is soft and elastic, seems as if filled with air, will disappear with a guggling noise, upon pressure : when the hand is removed, it more suddenly resumes its size, and its contents will seem to glide and slip under the finger. When the omentum takes a part in forming the swelling, the tumour will proportionately feel knotty, and is less likely to recede upon pressure. When however, a quantity of feculent matter is contained within a protruded intestine, a feeling resembling the presence of omentum is experienced. As the tumour contains omentum, or feculent matter, it receives an impression from the fingers, is heavier than when made up of intestine alone, and does not retire into the abdomen with a guggling noise. Most commonly, both intestine and omentum are the contents of the hernia; a circumstance which impairs the accuracy of very nice distinctions by the touch, though still, on pushing back the contents of the tumour, the presence of intestine, which returns the first, will often be indicated by the guggling noise, whilst the more solid omentum may be felt going up after it.

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* In this detail I have only reference to hernia in its simple and reducible form. I refer the reader to the Chapter on the progress of hernia, for the marks of the strangulated and irreducible state of the disease.

There is some difference, perhaps, in the symptoms of a reducible hernia, as it is of recent occurrence, or an old disease. In the former case, considerable pain may be expected about the tumour, and there may be also attendant some prominent constitutional symptoms, while, if the hernia has been of long standing, little else will be felt by the patient, than may be referred to the inconvenience of having an indolent tumour of some size in the groin.

Hydrocele is a disease with which inguinal hernia has been sometimes confounded; and, as water within the tunica vaginalis may exist in two situations, a hydrocele has been sometimes taken for a scrotal hernia, and at other times for abubo nocele.

In Hydrocele of the tunica vaginalis of the testis, the swelling commences, to form at the lower part of the scrotum, and as it increases, extends gradually from below upwards. It is more completely of a pyriform shape than scrotal hernia. As this tumour enlarges, the spermatic chord and testicle, are with difficulty traced, being involved in the swelling; while in hernia, they are in general, easily distinguished from the protruded parts. In hydrocele there is a fluctuation, or undulating feel, when struck by the finger; the tumour does not dilate upon coughing; and when a candle is presented to it, it is found to have a semi-transparent appearance.

There are instances of hydrocele, however, which bear greater resemblance to hernia, than has just been described. It is the case sometimes, that the tumour extends from below upwards, through the outer abdominal aperture, and nearly as far up as the internal ring. In these instances, it has precisely the shape of a hernia, and even dilates when the patient coughs, owing to the sudden pressure it receives from the motion of the abdominal contents. In cases of this kind, the diagnosis would be formed by the transparency, the fluctuating feel, the weight of the tumour, and the observed progress of the swelling.

It sometimes happens, from the tunica vaginalis of the chord remaining open throughout the oblique canal, that the water of hydrocele has free communication with the cavity of the abdomen; or the water of ascites finds a ready access to the cavity of the tunica vaginalis of the testicle; so that, in the different motions of the body, this cavity will be suddenly filled or emptied, as the patient may be near the erect or recumbent posture. The transparency and weight of the tumour when filled; with the particular sensation communicated to the hand while engaged in returning its contents to the abdomen, are the distinguishing marks of this state of disease.

In hydrocele of the tunica vaginalis of the chord, a difficulty is sometimes experienced in forming a diagnosis. If the cyst forming the hydrocele of the chord, is placed entirely below the ring, it is easily distinguishable from hernia; but when it extends in the oblique canal, a greater difficulty presents itself. The tumour may be expected to be considerably tense; hence the fluctuation is not so apparent; and from its situation, the test to ascertain its transparency cannot be resorted to. It may also be affected by coughing, as a hernia is; so that, upon the whole, the diagnostic marks are not readily distinguishable.*

Hematocele is likely to be mistaken for scrotal hernia, being of greater firmness than hydrocele, and more of the form of a hernial protrusion. The redness of the skin however, with which it is sometimes accompanied; it not being affected by coughing, and the swelling being more circumscribed, not advancing as far as the external abdominal ring; are sufficient signs perhaps, to distinguish it from any form of rupture.

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* Sir Astley Cooper himself, appears to have hesitated in deciding upon the nature of a tumour in this situation. It turned out to be a hernia, but it is clear he thought it might have been an encysted tumour of the chord, since he would not otherwise have operated, there being present no symptoms of strangulation. He speaks—

" The following case occurred to me. I was desired to see a boy, a patient of Mr. Clarke, surgeon in the Borough, who had a tumour which extended from the upper part of the scrotum through the abdominal ring along the chord, to the abdomen. The lad's father was anxious for the removal of the disease; but, on examination, it did not project sufficiently to enable me to judge whether there was either fluctuation or transparency. However, as it interfered with the boy's usual occupation, I resolved to cut down upon it with extreme caution. When I had reached, by incision, the surface of the cyst, I found the spermatic vessels running upon it, and was obliged to open the cyst by its side, to avoid these vessels. The cyst contained a portion of the small intestine, every where adhering to its inner surface which had prevented the return of the bowel into the abdomen. The vas deferens could be discovered behind the sac; so that this was a hernia, the sac of which had insinuated itself between the spermatic blood vessels and the vas deferens.'

The above case may be considered also, an example of the last variety of the oblique inguinal hernia, mentioned in page 82 of the first part of this work.

A scirrhus testicle is not liable to be confounded with hernia, since the difference is distinguishable by the form of the organ, which under morbid enlargement is retained; by the weight, and by the peculiar pain experienced upon pressure.

Varicocele, of all other diseases, is most frequently mistaken for inguinal hernia. When the spermatic veins are much enlarged, they dilate upon coughing, the tumour appears when in the erect position, and retires in the recumbent; but the swelling has a ropy feel, as if a bundle of chords were contained within the scrotum. It is recommended as the most efficient method to attain to a diagnosis; to empty the swelling by pressure upon the scrotum, when the patient is in a horizontal position, then in putting the fingers firmly upon the upper part of the abdominal ring, to direct the patient to rise. Now, if it be a hernia, the tumour will not re-appear while the pressure is continued; but if a varicocele, the enlargement will return with increased size, owing to the return of blood being prevented by the pressure from the finger.

Crural hernia is also sometimes mistaken for other diseases; but though not liable to be so frequently confounded with them as inguinal hernia, yet surgeons have been occasionally misled in regard to it, to the destruction of their patients.

An instance came under my own observation, while residing in Halifax in Nova Scotia, in the early part of the year 1820; wherein a femoral hernia was mistaken for an enlargement of the glands of the groin. The case was that of a gentleman of considerable standing in the community, who had been under, as it afterwards turned out, an irreducible femoral hernia for several years. His family physician had told him all along, that the swelling need not discomfort him, it being only from an enlarged state of the inguinal glands. At a time when this physician had gone into the country, I was called to consult with three others, upon what was considered by the patient, a fit of the colick. It was soon found however, that he was labouring under symptoms of strangulated hernia, which had continued previously, for three days, before he had asked for advice; he having no idea that the little tumour in the groin could have been the cause of the constitutional derangement. It was very soon determined, that his only chance of recovery, would be from the operation, which was accordingly performed, but we found the intestine in a gangrenous state, and he died the next morning.

Mistakes of this kind have been noticed, and as a surgeon's attention cannot be too closely directed to the importance of a diagnosis in hernia, I shall transcribe a remark for the benefit of my readers.*

It is possible for Psoas Abscess to be mistaken for crural hernia. The situation of the tumour, however, is among the sources of diagnosis. A psoas abscess is found to proceed down the thigh, under and towards the outer part of the crural sheath, in the direction of the fibres of the psoas magnus, and iliacus internus muscles, as they pass to be inserted into the trochanter minor of the os femoris. The tumour is enlarged when the patient coughs, is flaccid in the recumbent posture, and tense when he stands upright, it seldom entirely returns into the abdomen, and a fluctuation, indicating the presence of pus, is generally to be felt. A psoas abscess is preceded by pain in the loins, sometimes for months, and the swelling from it, when it has appeared in the thigh, is of more rapid growth than that of hernia. Fatal errors are not so liable to occur from psoas abscess being taken for a hernia. A truss, however, in such an instance, might be applied to the constitutional injury of the patient; but it has happened that a crural hernia has been taken for a psoas abscess, and a lancet plunged into the tumour.

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* "A man who was sent into Guy's Hospital for this complaint, by a surgeon in considerable practice, had been poulticed for three days, for what was supposed to be a venereal bubo; and, when the operation was performed, the intestine was found mortified. Also in the case which I have detailed on the authority of Mr. Bathune, a crural hernia was opened under the idea of its being a suppurating gland; the stools were discharged at the opening, and the patient soon after died. Now such mistakes as these must arise from inattention to the patient's account of the progress of the case, to the circumstance of the tumour appearing in the erect, and disappearing in the reclined position, and especially being dilated on coughing, together with a general irregularity of the bowels, costiveness, eructation, and vomiting. The following case, however, will serve to show the necessity of minute attention in cases of this kind. I was called to a lady, aged fifty-five years, by Mr. Owen, surgeon to the Universal Dispensary, who had laboured from Wednesday, the 12th of November, to Friday, the 21st, 1806, under symptoms of strangulated hernia. She had been attended by a Physician and Apothecary for *ileus*, but had not mentioned to them her having a tumour in her groin. Mr. Owen discovered a swelling in her right groin, which he told me was extremely hard, and did not feel to him like a hernia; yet he supposed from the symptoms, it could only be that disease. Upon examination, I found a gland enlarged to the size of a pullet's egg, and very moveable, but upon feeling behind the gland, I could perceive an elastic tumour, distinct from the swollen gland. I pressed upon it for about seven minutes, when a part of the tumour suddenly slipped into the abdomen, and in about three minutes more, the remainder returned, with a guggling noise. Fifteen minutes afterwards she had a stool, and had several others in the evening, when all the symptoms of strangulation had ceased. The glandular tumour still remained. This case struck me as important, both from the duration of the symptoms of strangulation, which was ten days, as well as from the combination of the two diseases."—*Cooper on Hernia.*

Sir Astley Cooper mentions a case wherein a varicose crural vein bore a resemblance to femoral hernia;[*] also an instance in which a steatomatous tumour at the groin occupied the usual seat of that disease.[†]

Dr. Monro speaks of an instance of a hydatid tumour which was removed from the inner and upper part of the thigh, that might easily have been mistaken for hernia; and he gives another example of it from Desault, who found it transparent when a candle was brought near to it, and that he could draw it from the crural arch, so as to leave a space between the tumour and abdomen, which proved that it was not formed from it.

But the several species of hernia may be confounded with each other.

The oblique inguinal hernia differs from the direct, from the latter having the whole chord on its outer side, while the first-mentioned has the chord behind it. A variety of the oblique inguinal hernia, however, spoken of in page 81, from this circumstance, might be mistaken for the ventro-inguinal species: here, then, the diagnosis must be assisted by the direction which the neck of the tumour may appear to take.

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[*] "Mr. Hosegood, surgeon in the Borough, requested me to see a patient of his, who had a tumour in the groin, which dilated when she coughed, disappeared in the recumbent, and re-appeared in the erect, posture, and which he informed me had been supposed to be a hernia. It was easy to detect the nature of the case; for although it disappeared in the recumbent posture, it was immediately reproduced, although she continued in that posture, by pressing upon the vein above the crural arch, and retarding the return of blood. She died of a stricture of the colon; and, upon inspecting the body, I found that I could readily thrust my finger into the crural vein, but that she had no hernia."

[†] "I lately dissected a person who had an artificial anus, in consequence of the operation for hernia, in whom I found on the left side, a steatomatous tumour, occupying exactly the place of the crural hernia. It appeared that this woman had laboured under crural hernia, that the sac had gradually contracted, for a very small portion of it remained at the crural orifice, and that the space had not only been occupied by fat, but that this had grown into a tumour of considerable size."

The existence of congenital hernia may be determined previously to an operation, by an attention to the period at which the disease had commenced; and also from the lowest part of the protrusion being as far down into the scrotum as the inferior point of the testicle. If in what otherwise might be considered a congenital hernia, the intestinal protrusion had proceeded no farther into the scrotum than just to the upper part of the testicle, it perhaps might be rightly thought not to be a hernia of that kind, since, if it had been one of the congenital form; there was nothing to have stopped the gut at that part: for, after it had got down for the whole extent of the canal of the tunica vaginalis of the spermatic chord, it would readily have passed into that of the testicle, the cavity being greater to receive it. This, however, might have been prevented by adhesions within the cavity of the tunica vaginalis of the testicle; but then again these are not likely to exist in the young subject.

The mistake, however, attended with the most mischief, is, when a femoral hernia is taken for an inguinal hernia. It is productive of injury and unnecessary delay in the administration of the taxis; and it is probable also, that it might be the cause of death, in reference to the operation.

From scrotal hernia it is of course readily distinguished, the tuberosity of the pubis being the discriminating mark: for the femoral hernia can be traced to have originated on the outside of this, while the other will be found taking the course of the spermatic chord.

A femoral hernia, notwithstanding, is liable to be taken for a bubonocele. It has been stated, that the tumour in femoral hernia, after having acquired a little growth, rises, and becomes seated above, or upon, poupart's ligament, so that it very much resembles the inguinal hernia while in the oblique canal. To ascertain the precise nature of the disease here, the course of poupart's ligament, in relation to the site of the tumour must be traced by the finger, which perhaps can generally be accomplished.*

Professor Mott has just informed me that a gentleman lately called upon him for advice, with an oblique inguinal hernia at the right side, with the peculiarity of the testicle on that side having never descended or passed the internal abdominal ring.

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* Sir Astley Cooper went with a Physician into the country to operate, as he was told, on a case of inguinal hernia; but when he examined the patient, he found that the hernia was crural, and had been three days strangulated; during which time repeated attempts had been made to reduce it, by pressing the tumour towards the spinous process of the ilium. It was reduced in five minutes, by employing pressure for crural hernia.

A surgeon who had operated on a crural hernia, sent his patient afterwards to London, to request that a proper truss might be procured for her; and in his letter stated, that, "during the operation, he had found the stricture, in this case, at the abdominal ring;" he was fortunate in having escaped destroying his patient. Another surgeon, in operating on a supposed *inguinal hernia*, had a venous hemorrhage arise, which delayed the operation fifteen minutes, and which he found was difficult to stop. It was a crural hernia, and it was probably the crural vein which he had injured, as he cut towards the spinous process of the ilium.—*Cooper on Crural Hernia.*

CHAPTER VI.

THE PROGRESS OF HERNIA, THE USE OF TRUSSES, AND THE TAXIS.

A Hernia will exist in one of three states.—The Reducible, wherein the tumour can generally be returned into the cavity of the abdomen, at the will of the patient, or retires of itself when he is lying down, although it may reappear when he stands upright. The Irreducible is that, in which, on some account or other, the hernia cannot be replaced within the natural cavity, notwithstanding the causes of strangulation are absent; and the Strangulated condition of a hernial protrusion, is that in which the contents of the tumour become so constricted, that violent inflammation is the consequence; and which, without timely assistance will soon have issue; by mortification of the part, and death of the patient.

In the Reducible hernia, although it is the milder state of the disease, the patient lives in constant danger; for in proportion to the difficulty with which the parts are replaced, he is liable from a sudden fall, any extraordinary exertion, or a period of costiveness, to have strangulation brought on. Besides, the reducible hernia is constantly on the increase, which, of itself, might be considered to be necessarily followed by symptoms of strangulation: and even should this period be protracted, the tumour will grow to an enormous size, prohibiting the individual from all active exertions,and place him under other formidable inconveniences.

To prevent these accidents, it is expedient to have recourse to an early application of bandages, in order that, after the parts are replaced, they may be retained within their natural cavity, and the opening through the abdominal parietes by which they passed, be allowed to close. This is the intention, although perhaps seldom completely effected, especially where the hernia has been long in the reducible state; so that a truss may be required to be worn for life—an annoyance sufficient of itself to point out the necessity of a speedy reference being made to its employment.

In the application of a truss, some things must be considered. It is necessary that the truss should not make too much pressure, as thereby the pad would insinuate itself beyond the level of the opening through which the hernia had first advanced; by which the hole would be widened, and the principal intention in the application of the instrument frustrated. It is necessary also, that the pad of the truss should not make too little pressure, in which case the descent of the gut would be invited, when the pressure of the truss might be in such a case the immediate cause of symptoms of strangulation. To obtain a medium then, it is necessary that the part of the truss passing from the groin to the loins, should have within it a strap of tempered steel, calculated to give the precise degree of force required; and it is expedient that this strap in its passage from before backwards, should not pass very close the dorsum of the ilium, or touch the upper part of the thigh, lest it might be affected by the motions of the lower extremity. An uniform and well-directed pressure is the indication to be fulfilled in the application of a truss, and in the accomplishment of this, it is right at the same time to choose an instrument that will at once allow of the most free motion of the body, and the least possible interference with the uniform and particularly directed pressure required by the pad of the instrument.

It will be in place now to describe the truss I think best calculated to answer these ends.

Various contrivances have been got up under the name of trusses, for the purpose of restraining hernial protrusions, and keeping within their proper cavity portions of abdominal viscera. Notwithstanding, however, the different forms which these instruments have put on, in their advance to perfection, they have been, for the most part, objectionable in some point or other. The simple pad and bandage could not answer the purposes designed, from being incapable of making a particular pressure upon any of the abdominal apertures. To effect this a steel spring was added in the shape of a strap of a certain degree of curvature and covered with leather; this was placed around the hip as far as the spine, and secured in that situation, by a leather strap connected with it, that was looped at its end, to be attached to the pad at the groin, after coming round the opposite ilium. And to secure this more effectually, another strap was placed between the thighs, and fixed to the truss before and behind. This might have answered every purpose, if the patient had remained at rest; but it was found on the several motions of the body, that the pad would become removed from the spot to which it was first applied, and, by allowing the hernia in part to descend, would become a cause for strangulation. To remedy this evil, the pad was afterwards fixed upon a rack, so that its position could be changed according to the form of the abdomen, and be more completely adapted to the part, as circumstances might require. In other instances a screw was placed in the plate of the pad, by which the cushion might be pushed in, as far as thought requisite for the support of the part, under the particular motions of the body. But it was still found that something was required yet to be done to complete the mechanism of a truss. And the instrument which I think the most perfect of its kind, and which seems to answer every desirable purpose, is the Patent Self-adjusting Truss of Messrs. Salmon and Oddy, Truss-makers, London, which I shall now attempt to delineate.

This Truss has two pads, one for the groin, and the other to be situated at the side of the lumbar spine, which are connected by two or three steel spring straps, enclosed in a sheath of buckskin. The pad for the groin has an oval convex iron plate, on which the cushion is placed; and at the centre of the outer part of this plate, is a contrivance for a ball and socket joint, constructed of brass. To the ball is attached a brass slide of about two inches in length, on which is received the anterior extremity of the inner steel strap. They are adapted to each other by a screw passing into one of three or four holes in the end of this strap, that it may suit the particular measurement of the patient. The pad behind is rounded and very soft, being made up of a circular iron plate, with a cushion of wool, covered with glove leather. Fixed at the centre of the back part of this plate, is a nut, into which a screw is received that connects the posterior extremity of the inner steel strap to the pad. The steel straps are made of the best material, and are more than one in number, that the force of the spring may be better regulated, and more likely to continue efficient for a length of time. Another advantage is derived from this contrivance: the aggregate weight of metal required for the particular force, is less than if there was only one steel strap present.

When this truss is applied, a free exercise of the limbs or of the whole body will in no wise interfere with the pressure made by the pad at the groin. The motion between the straps and this pad, from the nature of the ball and socket joint, is in every direction, and is regulated by the resistance made by the parts at the groin, in such a manner, that constant and equable pressure is kept up against the enlarged abdominal aperture. From the circumstance, moreover, of there being a circular motion between the posterior extremity of the straps and the back pad, this rib of straps can be lifted up and lodged above the ilium, on the soft parts of the abdominal parietes, to answer the convenience of the patient in walking.

The fore pad of this truss should be formed to answer the particular species of hernia at the groin. If the hernia should be an indirect inguinal, it is right that the pad be completely oval, in order that the whole inguinal canal may be pressed upon. But if a direct inguinal, then the pad might be round, and very slightly convex. But when the recurrence of a femoral hernia is to be prevented, a pad is to be made use of, that shall be of a conical form, the base of which shall have a small diameter; for the crural aperture being considerably deep seated from the parts with which the pad is to be immediately in contact, and the opening itself not being dilatable, there is no danger to be apprehended from the femoral ring being enlarged by such a pad. Sometimes it will be necessary, in an irreducible omental hernia, to prevent its enlargement by a spring truss. In such a case, the pad should be concave, and formed of a ring of metal, having attached to it wool enclosed in glove leather, in such a way that the indication shall be answered.*

A hernia may be rendered irreducible from the following circumstances:

When a protrusion has existed a long time without means being adopted to restore the parts, and keep them within the abdominal cavity by a proper truss, it increases in size so much as to be incapable of being returned. This increase is as much owing to extensive depositions of fat about the protruded parts, for the purpose of their defence, as to the descent of new portions of intestine or omentum.

Sometimes membraneous bands run from one side of the sac to the other, thereby entangling its contents. In this way protruded parts have been kept down, although there was no immediate adhesion between them and the sides of the sac.†

Sometimes both intestine and omentum will be firmly united to the hernial sac by adhesion, and in this way rendered irreducible. This is likely to occur in recent herniæ, or in the active state of the disease; hence the great expediency of an early application of the Truss.

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* I have to state, that Mr. John Creswick, Surgeon's Instrument Maker, at No. 2 Garden-street, New-York, is acquainted with this kind of Truss, and about to make a quantity for sale. When a truss is required of him from a distant part of the country, it will be necessary that the kind of hernia be specified, and the measure of the patient forwarded. This last will be ascertained by passing a tape round the body, above each trochanter of the thigh bone, and below the crest of the ilium on each side. With such information, he will be able to answer the order and fit the patient.

† Sir A. Cooper is of opinion that these membraneous bands find their existence in the following manner.—During the reducible state of a hernia, inflammation takes place both in the contained parts and the inner surfaces of the sac; but by using proper means, the protruded parts are reduced, and the sides of the sac collapse and adhere together. However, while the adhesions are still in a glutinous state, a fresh descent takes place from the abdomen, and the hernial contents again disunite the surfaces of the sac every where, except at the points of union of these inflamed parts, the cementing lymph of which, instead of bursting asunder, elongates with the first pressure, and forms these membraneous bands, which are seen passing from one side to the other. Between these, the intestine and omentum get entangled; a circumstance which adds so much to the difficulty of reduction as to make it in general considered as impracticable; and there is scarcely a possibility of detecting by the feel, this variety of the disease in the living subject.

The hernial sac is stated to have been found contracted in its centre in the form of an hour-glass, to a degree short of bringing on strangulation, but sufficient to make the hernia irreducible.

As soon as a hernia is allowed to become irreducible, the patient is immediately placed in imminent danger, being constantly exposed to the causes of strangulation; for undoubtedly the irreducible state of hernia is an advance from the reducible, in progress towards the strangulated form of the disease. And besides, there are incidents occasionally taking place with a hernia that cannot be returned, which make this form of the complaint to be dreaded.

Mention is made of a man who was brought into St. Thomas' Hospital, that had an irreducible scrotal hernia. He had fallen from a ladder, and had his scrotum struck upon the edge of a piece of wood. After complaining of violent pain and tension in his abdomen, in four hours he died. When his body was examined, a portion of the ilium which had formed a part of the hernia was found ruptured. Many cases are recorded of bursted intestine, succedant to a blow upon an irreducible hernia.

Sir Astley Cooper records the case of a boy; while speaking of ulceration being a danger to which irreducible hernia is exposed. The lad was aged thirteen, and admitted into St. Thomas' Hospital, having an irreducible scrotal hernia, from which a quantity of fæculent matter was constantly discharging through a small hole at the bottom of the tumour. He remembered having accidentally swallowed a pin, and five weeks afterwards his hernia began to swell, and to become very painful. A poultice was applied, and an abscess formed, which soon after burst; and on looking at the orifice by which the matter was discharged, the point of a pin appeared projecting from it, which was easily extracted. A fistulous opening of the intestine remained, for which he was admitted into the Hospital. Attempts were made to unite it by paring off the edges of the wound and encouraging adhesion, but without success.

The growth of hernia is in nowise suspended by becoming irreducible; it increases as rapidly as before; and as it advances, can "hold its own!" The instance of the celebrated historian Gibbon, is a striking example of this; and, as his case is interesting, it shall be detailed. We are informed that "he had for thirty years been subject to an irreducible scrotal hernia on his left side. And to which he applied no remedy to prevent its increase. In the summer of 1793, finding it grow suddenly uneasy, he became alarmed, and consulted Sir Walter Farquhar and Mr. Cline. The tumour being then of uncommon size, reaching to his knees, and very large at its connexion with the abdomen. There being some fluid perceptible at the lower part of the tumour, it was tapped in the November following, and a large quantity of water was drawn off. In a fortnight afterwards, it was again tapped, and three quarts of water were evacuated, without any very sensible diminution of the swelling. Six weeks afterwards, the skin over the tumour having inflamed, and showing a disposition to ulcerate, the tapping was again repeated, Jan. 13, 1794, when six quarts of water were discharged. Two evenings afterwards he began to complain of pain in his stomach, and soreness in the abdomen and in the tumour, on pressure. He passed the night restlessly, and next morning when he rose, he seemed in better health and spirits than usual. Soon after, he became insensible, and expired at about eleven o'clock."

"On examination after death, the abdomen was found nearly emptied of all the moveable viscera, no omentum remaining within its cavity, and of the intestine only the duodenum and cæcum. Even the pyloris was drawn down so low as to lie upon the orifice of the hernial sac, into which all the omentum and all the intestines except those just mentioned, had descended. They were all uncommonly loaded with fat and slightly inflamed. The hernial sac extended nearly as low as the knee; its orifice was so large as to admit the hand within it. Below the sac appeared a separate bag, large enough to hold several quarts of water, which, by its containing the testicle, proved to be the tunica vaginalis testis."

In large hernia from the sunken state of the penis at the upper part of the tumour, the forepart of the scrotum becomes excoriated by the dribbling of the urine over it, which is the cause, sometimes, of deep and extensive abscesses between the integuments and hernial sac, and which soon show themselves outwardly by permanent fistulous orifices. If these abscesses should not have been produced, there is, nevertheless generally, an extensively inflamed and erysipelatous surface on the forepart of the scrotum, from which a most disagreeable and offensive ichor is made to emanate. A laced bag truss is the most simple and perhaps effectual remedy for irreducible hernia, when it is of the scrotal kind. It will support the scrotum, and preserve a steady pressure upon the parts, by means of which may be occasioned a gradual absorption of what adipose matter may be within the hernial sac, by which the tumour will be much lessened, and may in the end be returned.

The application of ice also, has effected the return of a hernia which had been irreducible.

Long confinement to bed has in some instances, been succeeded by the return of the contents of an irreducible hernia; and was this prescription accompanied with a strict depleting course and extreme fasting, there would be little doubt perhaps, of ultimate success.

It now and then happens, from a variety of circumstances, that the contents of a hernia become so pressed upon, especially about the neck of the tumour, that when intestine is down, the fæces are interrupted in their passage, and at length arrested: also, by it the free circulation of the blood is impeded in both intestine and omentum. This state of things is not long present, before violent constitutional symptoms show themselves, attended by an inflammation of the contents of the hernial sac. We have now a strangulated hernia, to remedy which, it is expedient that the surgeon be well acquainted with the anatomy of the groin; for, if an operation should be necessary, he has no time to learn the parts, but must proceed without delay, to the relief of his patient.

There will be first felt a tenderness, and then pain in the tumour, immediately derived from the pressure about its neck. This is soon followed by a constitutional alarm, that shows itself by considerable excitement, a hard and quickened pulse, sickness, frequent eructations, and at length vomiting. In the first place the contents of the stomach are ejected, then bilious matter from the upper portion of the small intestines, and afterwards, what is thrown up is of the character of fæces, from the anti-peristaltic motion of the intestines, which has become established through their course as far as the strictured part. If omentum only is down, the stercoraceous vomiting may not be present, or only in a slight degree. Yet the disposition to empty the stomach will prevail, from a sympathy taken on by that organ. From the same cause also, hiccough is a prominent symptom in strangulated hernia. When this can be referred to a sympathetic action of the respiratory muscles, in the inflammatory stage of the disease, it is not so alarming as when it is indicative of gangrene. Perhaps the hiccough in these two instances, may be distinguished; the former being derived from a spasmodic action of the diaphragm merely, while the whole respiratory muscles would be united in the latter to produce the convulsive motion. Obstinate costiveness is another symptom to be looked for; yet when omentum is only incarcerated, sometimes free evacuations can be obtained by the aid of clysters. As the inflammatory stage has continued, there is pain all over the abdomen upon pressure, and great tension also, from the whole intestinal canal being filled with air. On examination of the tumour at this time, there will be less pain than in the first instance; but the common integuments covering the swelling, will retain the mark of the finger, owing to an effusion of lymph, which shall have taken place in the cellular membrane.

If relief is not had, the disease goes on towards a fatal issue. The patient, having suffered much pain and distress for two or three days, becomes suddenly easy, and expresses great satisfaction at this change. The tumour however, still remains; giving a crackling feel when pressed upon from air being seated under the skin; and it assumes a purple hue. The swelling of the abdomen now increases and becomes more tense; a cold sweat covers the body, and the hiccough is more violent. The pulse also, if minutely attended to, will be found to be intermittent; and in this way the case goes on, the patient being perfectly sensible, and full of hopes generally, till the very period at which death puts an end to the complaint.

OPERATION OF THE TAXIS.

It is not my purpose to enter into a detail of the medical treatment of strangulated hernia, as that would not have the immediate relation to anatomical structure which is the design of this work; but I shall speak of the Taxis as one of the means resorted to for relief.—Since the escape of parts from their natural cavity is the first cause of all the mischief, the indication would be to restore them. To effect this, the surgeon will proceed to the Taxis; and, for the successful performance of this operation, it is somewhat necessary that he shall have made up his mind as to the particular species of the hernia; but above all, it is highly expedient that he be sure whether the hernia be of the inguinal or femoral kind. Before the patient is placed in a position to receive the taxis, he should be directed to empty his bladder, as thereby all possible room would be given to aid the return of the protruded parts.

The position in which the patient should be placed to favour a reduction by the taxis, is the next consideration; and this will be found to be such an one as will relax the abdominal muscles, and fascia lata of the thigh. The extremity of the sternum must be approximated to the pubes. This is to be effected by placing the patient on his back, then raising the shoulders, and, at the same time the pelvis, by pillows, so that the spine shall be made convex backward. The abdominal muscles will now be all in a relaxed state: the two recti will have their extremities approximated, by which the belly will be allowed to fall in, and the transversalis abdominis will be slackened; so that, if the hernia should be a direct inguinal, with its neck passing between the fibres of the tendon of the transversalis; from this muscle being relaxed, the attempt to reduction will be assisted. The oblique inguinal will also be favoured by this state of muscular relaxation, the lower edges of the internal oblique and transversalis, where they pass by the upper part of the internal abdominal ring will then be found to produce less constriction. The external abdominal aperture also, if it should be contracted around the neck of the hernial sac, will have its borders loosened by the relaxation of the external oblique, and the whole oblique or inguinal canal will have its capacity enlarged by the general flaccidity of its boundaries. By elevating the thigh, and directing it over the opposite extremity, the fascia lata will become wrinkled, and its tension upon the femoral muscles suspended. Poupart's ligament, by this, will be allowed to assist in the general relaxation of the parts concerned in inguinal hernia, and the loose state of the fascia lata will aid the reduction of that crural hernia which shall have been impeded by being bound down by its falciform process. But crural herniæ generally, strangulated at the crural arch, are not to be relieved much by the position thus recommended. I do not mean, however, that such a posture will interfere with their reduction by the taxis; but merely to remind the surgeon, that he is not to expect a great deal, by any position in which he may place the patient, to assist in its reduction by the taxis; as has been hinted while upon the structure and connexions of the crural arch.

The pressure to be made upon the tumour by the hands of the surgeon, is to be gentle at first, then gradually increased; but never to produce pain. The parts are not to be pressed in a mass against the aperture from which they have escaped; but while the tumour is held in one hand, the two fore fingers of the other are to be applied about its neck, so that by kneading, the progress of parts may be facilitated through the opening. Sometimes, when intestine is down, and much inflated, a general pressure on the whole tumour by both hands, will occasionally be followed by quick success; in which case, the air will be heard to go up with a guggling noise, when the remainder of the tumour may be returned without much difficulty.

The course of the neck of the tumour must be kept in view in the attempt at reduction. Thus the practitioner will not be satisfied when he has returned the oblique inguinal hernia merely beyond the situation of the external abdominal aperture, but will have had his attention directed, during the time occupied by the taxis, to assist the parts through the whole course of the oblique canal.

In making use of the taxis for crural hernia, it is necessary to remember the direction this hernia takes after the escape of the gut from the abdomen. By a reference to page 88, it will be seen that the femoral hernia, as it protrudes, tilts upwards, and becomes seated upon the tendon of the external oblique muscle, over the inguinal canal, and that it is to be expected to be found in this situation before it becomes strangulated. On the attempt to reduce it by the taxis, therefore, the tumour must first be bent downwards by a thumb and two fingers, with a gradual and steady pressure, until the swelling has got below the line of poupart's ligament. It is afterwards to be pressed inwards, against the upper part of the thigh, and then upwards, that it may have passage under the crural arch.

Much perhaps might be said upon the effort of the taxis: but I believe the surgeon's ingenuity, assisted by a correct knowledge of the parts, must be exercised in individual cases; keeping in mind always to conduct the process with as little violence as possible: as every kind of pressure or disturbance of the tumour, in strangulated hernia, is an additional excitement to inflammation, and a new reason why the operation by the knife should not be deferred.

CHAPTER VII.

THE OPERATIONS FOR STRANGULATED HERNIA.

Was I the subject of a strangulated hernia, I think I would not, under the most favourable circumstances, suffer the operation by the knife to be delayed more than six hours from the time of the first symptom of incarceration;—a very small portion of which period I would consent to have occupied with the taxis. Mr. Hey, whose work is a text book in surgery, has written, "if Mr. Potts' opinion be true, that the operation, when performed in a proper manner, and in due time, does not prove the cause of death oftener than perhaps once in fifty times, it would undoubtedly preserve the lives of many, to perform it almost as soon as the disease commenced; without increasing the danger by spending much time in the use of means which cannot be depended upon for a cure;" and, "I have twice seen this disease prove fatal in about twenty-four hours." Again: "I have now, at the time of writing this, performed the operation forty times; and have often had occasion to lament, that I had performed it too late, but never that I had performed it too soon. There are some cases so urgent, that it is not adviseable to lose any time in the trial of means, to produce a reduction. The delay of a few hours may cut off all hopes of success, when a speedy operation might have saved the life of the patient. I am persuaded that much harm has been done by long continued efforts to reduce the strangulated intestine, especially when it is in a painful state. The patient who has been accustomed to reduce his own hernia, will perform the operation of the taxis with the greatest safety. If he fails, the surgeon should be cautious in doing much."

Sir Astley Cooper gives similar testimony, and attributes the fatal consequences attending these operations, under ordinary circumstances, to the improper delay in their performance; and says, that as soon as bleeding, the warm bath, the tobacco clyster, and topical cold have been fairly tried, and have proved unsuccessful, if the abdomen is becoming tense and painful upon pressure, the operation should be no longer delayed; and signifies, that the warm bath had better be omitted than wait a length of time for its preparation, as we sometimes have to do in private families. With this, mention is made of a drawing of a large intestinal and omental hernia, in the Museum of St. Thomas' Hospital, which Mr. Else used to state, in his lectures, proved fatal in eight hours from the first appearance of strangulation. He is moreover of opinion, that there is scarcely any period in the progress of the symptoms of strangulation which should forbid the operation; but thinks, that if mortification of intestine has been begun, the operation will expedite the separation of the gangrenous parts, and be thereby the means of saving the patient's life.

The operation of itself, if performed as a knowledge of the anatomy of the parts would direct, cannot but be said to be attended with little danger; and I do not see why it might not be considered judicious practice, to cut down and lay open a hernial sac, in the irreducible form of the disease, for the purpose of relieving a portion of detained intestine. I wish, by this remark, however, only to be understood, that I know of no excuse that would apologize for the delay which we generally witness before this operation is resorted to; or which would authorize the surgeon who is to be the operator, in allowing half a dozen consultants to take their turn in squeezing the tumour under the pretence of giving full trial to the taxis.

THE OPERATION FOR BUBONOCELE.

To prepare for the operation for hernia, the patient will be placed with a matrass, upon a table of ordinary height, in a horizontal posture, having his shoulders a little raised, his legs separated, and hanging over; also, the one of the side to be operated upon, will be a little elevated by a pillow under the ham. The pubis and groin of the diseased side will now be shaved by an assistant, who is also to satisfy himself that the urinary bladder is empty.

The hernia, the operation for which we are now to consider, will be found much to resemble the femoral species; except that it can be traced distinctly above poupart's ligament; and it will be seen an oval tumour, with its longest diameter extending in the direction of the oblique canal. The surgeon, having placed himself between the thighs of the patient, which perhaps is the most convenient position he can take for all states of the disease, will commence his incision from over the outer margin of the tumour, and continue it downwards and inwards, as far as the swelling may reach towards the tuberosity of the pubis. This will be in a line over the middle of the tumour, in the direction of its greatest diameter, parallel to poupart's ligament, and will divide the common integuments. These are now to be dissected back, above and below, for the extent of the swelling, or as far as may allow the surgeon to distinguish the parts underneath. He will then have in view the superficial fascia. In this situation, however, and under the circumstances of bubonocele, it will be found merely to be a layer of cellular membrane, and not the formidable and dense covering which it is in the other forms of hernia. In this species, the resistance given by the tendon of the external oblique muscle, does not admit of the fascia superficialis growing much under the hernial pressure. This fascia therefore, and the tendon of the external oblique muscle, will be the subjects of the next incision, which will be carried over the tumour in the direction of the first, though not to quite so great an extent. The handle of the knife will now be introduced under the tendon a little way, in order to separate it from the tumour, that the remainder of the swelling may be distinctly brought to view. He will have now before him the covering afforded the tumour by the cylindrical process of fascia sent off by the internal abdominal ring. The cremaster muscle, if sought for, will be found taking its course under the tumour, being pressed upon by it against poupart's ligament; and, if the hernia has been of long standing, its fibres will be with difficulty distinguished—so far is it from giving a covering to a hernia in this situation. The next covering to be opened, is the one just spoken of, afforded by the edges of the internal ring. This, lest it might be consolidated with the hernial sac, is to be opened in the same cautious manner, as it would be prudent to enter that cavity: it will be elevated over the centre of the tumour by a pair of dissecting forceps and by a scalpel the edge of which shall cut in a horizontal direction: an opening will be made of sufficient size to admit a director, with which, and a probe pointed bistoury, this tunic will be laid open in both directions to an extent that may be thought sufficient to facilitate the return of the protruded parts. If it has happened that the peritoneal sac is still unopened,* the cutting into this will be proceeded upon in the same careful manner, first with the forceps and scalpel, and then with the bistoury and director, not to endanger the contents of the hernial sac. There will be no difficulty in ascertaining when the sac is really opened; there always follows more or less of a fluid, which is from serum and of a light colour, to blood itself; and is the consequence of the stricture upon the protruded parts.

With respect to the division of the stricture in this hernia, I will refer to the operation of oscheocele, which is next to follow, as the same observations will apply: also, what might be said concerning the return of the protruded parts will be found in that division of the subject, and may be considered as having reference to the other forms of the disease.

It has been proposed in bubonocele to return the peritoneal sac with its contents into the abdominal cavity unopened; but I believe a stricture cannot long exist around the neck of a hernial sac, without inducing such a contraction of the sac at the part, that the contents, even if it were practicable to return them with it, would be incommoded in their action, if the symptoms of strangulation did not continue to the destruction of the patient. Of this I am more convinced, since I have been led to make observation from the following fact:—I have seen the operation for strangulated hernia performed, and have performed it myself, in instances wherein the contents of the hernial sac appeared fit to be returned, they were replaced, yet the patients have died from general inflammation of intestines and peritoneum; which to my mind could not be explained in any other way, than that the intestine had its canal so contracted by the stricture at the abdominal aperture, while it was down and in a strangulated state, that although returned, this contraction remained, to the issue of continuing the symptoms, until death was the consequence.*

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* In the second edition of Mr. Hey's Surgical Observations, page 155, while speaking of an operation for bubonocele, after stating the division of the tendon of the external oblique muscle, says, "the hernial sac contained in its substance, some layers of adipose membrane." This certainly must have been an additional thickening given the peritoneal sac by the cylindrical process sent off by the fascia transversalis; since, in that case, there is no other mention made of that covering.

It will be in place now to state, what ought to be the practice in an operation, which would guard against similar events. The intestine in the sac will never be found in a collapsed state, but filled either with air or fæces, or with both. The surgeon will then, previously to returning the protruded gut, draw it down a little, and examine it at that part, where it lay under the stricture. If the canal of the intestine appears in that situation contracted, by a general pressure on the gut below, he will be able to send some of its contents beyond this part, which will serve the purpose to dilate it here, when it may be safely returned.

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* "It has been proposed to return into the abdomen the hernial sac, without opening it. For this purpose, the stricture is first to be divided, the intestine and omentum returned from it if possible, and the sac is then to be pushed into the cavity of the abdomen.

"In a very small hernia, this operation is practicable, because the sac has then contracted no strong adhesions to the surrounding parts; and it can be also readily done in the female: but if the hernia is comparatively large, it cannot be effected without much dissection, which, in inguinal hernia in the male, could not always be safely performed, on account of the frequent varieties in the course of the spermatic chord, the vessels of which, in large herniæ, are always more or less turned from their usual course.

"As there would be often much difficulty in executing this part of the operation, it will be best to push back the contents only, without attempting to return the sac; as the patient is equally liable to a future protrusion, although the sac is returned—as the following case will prove:

"Mr. Weld, jun. surgeon at Romford, was called on May the twenty-fourth last, to a woman of the name of Moore of that place, who laboured under symptoms of strangulated hernia, proceeding from a tumour of this description, at the abdominal ring. All attempts to reduce the hernia having failed of success, the operation was performed of cutting down upon the tumour, separating it from its adhesions, and dividing the stricture which was at the abdominal ring. The sac and its contents were then returned into the cavity of the abdomen, as there was no reason to suspect the existence of mortification. The wound healed in the space of a fortnight, and the woman recovered.

"This operation was so far successful, and does Mr. Weld great credit; but he has since written to inform me, that the hernia has reappeared, as the woman could not wear a truss upon a part which was still tender, from the operation. However, she experiences no inconvenience from it, as it can be now readily returned into the cavity of the abdomen. As it appears, therefore, that the return of the sac into the abdomen, will not be attended with a radical cure, if there is any danger from the size of the tumour, or from the position of the spermatic vessels, it is an attempt which should not be made unless the intestine adheres; and it should never be done under any circumstances, unless the sac is first either emptied of its contents, or the stricture is clearly divided, as there is danger of the symptoms of strangulation continuing, if the mouth of the sac is contracted, and it remains undilated."

Cooper on Hernia.

After this operation, a truss with an oblique pad should be put on, as soon as possible, as the abdominal parietes will have been much weakened by the incision into the tendon of the external oblique muscle.

THE OPERATION FOR OBLIQUE INGUINAL HERNIA AFTER IT HAS DESCENDED THE SCROTUM.

After the ordinary preparations have been gone through, the surgeon will grasp the tumour with his left hand, and make an incision with a common scalpel, to extend from opposite the external abdominal ring to the bottom of the scrotum; or it may be continued from that part for about three or four inches, if the hernia is very large; so that sufficient room may be given to handle the contents of the tumour in the act of replacing them. This incision will divide the common integuments, and with them generally, the upper branch of the external pudendal artery. This vessel will be found crossing the tumour just below the external ring, and may be secured by being compressed by the finger, by being pinched by the forceps, or by a ligature if it should give out much blood. The surgeon, continuing to grasp the tumour from its back part, will find that the integuments of the scrotum will readily recede from the loose state of the reticular membrane connecting these to the parts underneath, so that he will have a clear view of the next covering of the hernia, without the necessity of dissecting off its first tunic. He will find that the skin of the scrotum has not been thickened from the hernial pressure, because it gave a very slight resistance to the growth of the tumour.

THE OPERATION FOR OBLIQUE INGUINAL HERNIA AFTER IT HAS DESCENDED THE SCROTUM.

The swelling will now be seen covered by that process of fascia superficialis sent off from the external abdominal ring to accompany the chord. This is made thick by the hernial pressure, and is a formidable covering in this form of the disease. An opening can be made into this, at any part, and by means of a director and bistoury it is to be continued upwards to near the abdominal ring, and downwards to the extent of the first incision.

By separating a little this covering by the handle of a knife, the cremaster muscle will become exposed. This we will find to have grown with the hernial swelling, to have acquired thickness and extent, and to give a general covering to the tumour. It is to be divided as was prescribed in the foregoing instance: so that by cautious cutting with a bistoury on a director, the peritoneal sac may be completely brought to light.

The hernial sac is now to be divided. It has generally a fluid within it, in quantity equal to the size of the part strangulated, which will be expected to be seated at the lower part of the swelling. It is at the anterior and inferior part, then, that the sac can be raised with a pair of dissecting forceps, for the purpose of being opened, as it can be done here with less danger of wounding intestine underneath. The surgeon now, with the edge of a knife placed horizontally, will make a small opening, sufficiently large for the end of a director, upon which, by a bistoury, a cut will be made of size to admit his fore finger; and then, with the bistoury on his finger, he will continue the incision till within an inch of the abdominal ring.*

The sac being now laid open, the contents of the hernia are brought to view; and the next thing to be done to relieve these from stricture, which has been said will be found, in one of the three following situations:

First, at the external abdominal ring.

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* The sac should not be divided higher than an inch below the external abdominal ring, as its division near the abdomen makes it more difficult to close the wound, and exposes the patient to greater danger of peritoneal inflammation.—*Cooper on Hernia.*

Secondly, at the situation of the internal abdominal ring. And

Thirdly, in the mouth of the hernial sac.

When in the first situation, the surgeon will proceed to relieve the stricture by passing his finger as far up as he can within the hernial sac. He will then insinuate a probe pointed bistoury flatwise between the sac and the upper boundary of the external ring, and divide by turning the edge of the instrument upwards and a little inwards, so that the tendinous fibres of the upper or inner column of the external oblique muscle may be cut in a direction rectangular with their course. By cutting in this way, a less extensive incision will be required than in any other. It is right that this tendinous stricture should not be more extensively dilated than is merely necessary to allow of the return of the protruded parts, since we are not to expect, for a very considerable time, that the abdominal parietes will be here as firmly supported as they are on the opposite side.

When the stricture is discovered to be in the second situation, which will be ascertained by following with the finger the neck of the sac, it will be found to be from one of two sources:—the inferior edges of the internal oblique and transversalis muscles may, by being attached further inward to poupart's ligament towards the pubis than usual, make such pressure upon the neck of a hernial tumour as to be the cause of strangulation—or, the stricture may be produced by the margins of that opening in the fascia transversalis (the internal abdominal ring,) through which the spermatic chord makes its first exit from the abdomen.

The surgeon, having his finger within the hernial sac and up the oblique canal opposite the seat of stricture, will proceed by introducing a probe pointed bistoury,* with its flat side towards the finger, and cutting edge facing the spine of the ilium. In this direction the instrument will be insinuated immediately without the hernial sac as far as the under fibres of the muscles just named, when its edge will be turned upward by a gentle motion of the handle; and then with the finger within the neck of the sac, he will expedite the division of the stricture. These muscular fibres will be divided opposite the course in which they run: thus the incision for dividing the stricture, when produced by the under edges of the external oblique and transversalis muscles, will be made upwards and outwards. The extent of the cut will be regulated by the size of the hernia, and the room which is given to continue the finger beyond the neck of the hernial sac. When, however, it is not practicable to advance the finger after this division of muscular fibre, it is to be inferred that the seat of stricture is in the internal abdominal ring: and what is now to be done, is to continue the bistoury a little deeper, until it shall have got beyond the line of this opening in the fascia transversalis—The edge of the instrument is to be again turned up, and an incision made with it by the assistance of the finger, in the same direction as the former. The knife will now be withdrawn, after being placed in the same manner in which it was introduced.

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* The bistoury here meant, is the knife invented by Sir A. Cooper, for dividing the stricture in inguinal hernia. It has a cutting edge, of about an inch and a quarter long from the point; the remainder of the blade having no edge; so that, while it is up the oblique canal, and dividing the stricture at the internal ring, the tendon of the external oblique is not in danger.

If the hernia should not now be liberated, the conclusion is, that the neck of the peritoneal sac has become thickened and contracted so as to have been the cause of symptoms of strangulation. To relieve this, the finger will be continued up the sac, and the bistoury lying flat upon it, will be carried opposite the strictured part, as in the former case. The edge will now be turned, and the stricture divided upwards and outwards. The neck of the peritoneal sac must be divided for as little extent as possible, as much cutting here would endanger the patient's life from peritoneal inflammation. It is therefore fortunate that it very rarely happens that the seat of the stricture in strangulated hernia is found to be in the mouth of the peritoneal sac.

The next thing to be done is to return the protruded parts, and, after the surgeon has drawn down the intestine a little to satisfy himself that it is free from adhesion at the mouth of the sac, as well as that it is not contracted at the strictured part, he will proceed to return it immediately, and with the greatest care, by first pressing up its contents and then the gut itself, by a small portion at a time, securing each part with his fingers until the whole be returned into the abdomen. He will now bring the parts carefully together, and by one or two interrupted sutures, connect the common integuments over the wound.

In that variety of oblique inguinal hernia wherein the tumour passes behind the spermatic chord, it will be difficult to discriminate whether it may not be a direct inguinal. It must be so rare an occurrence however, that the surgeon will not be inclined to trouble himself much about it. It is nevertheless of consequence that he be fully satisfied, during an operation, whether the hernia be a direct or an oblique inguinal, as this knowledge will regulate him in the division of the stricture, in order that the epigastric artery may be preserved from danger.

In the variety also, where the hernia splits the chord; while performing the operation, the surgeon will find himself much embarrassed. No particular rules can be laid down here for operating, but when the surgeon has made himself sensible of the fact, he must proceed with the utmost caution to the division of the stricture, guarding against wounding the epigastric artery on the one hand, and the vessels of the chord as they may take their course about the tumour on the other; which last he must ascertain from a careful inspection into the individual case.

THE OPERATION FOR THE DIRECT INGUINAL HERNIA.

The tumour will be grasped by the surgeon as in the previous instance, and an incision made on the forepart of the swelling, from opposite the ring to the bottom of the tumour: previously to making it, however, the surgeon will satisfy himself as to the situation of the spermatic chord, that he may avoid cutting upon it. It will be found lying on the upper and outer part of the hernia, and the cut through the common integuments is therefore to be made to the inner side of the chord. If any of the external pudendal branches bleed, they are to be secured as previously directed. The tumour will now present itself, covered by the superficial fascia sent from the external ring. This is to be very cautiously divided, because immediately below it in this form of hernia, lies the peritoneal sac. To open this covering, the bistoury and director must be made use of; and by these it is to be divided for the extent of the first incision. The peritoneal sac, which will now be exposed, is to be divided as recommended in the last operation; and from an inch below the abdominal ring to the bottom of the tumour.

The surgeon now, by introducing his finger into the sac, will examine for the seat of stricture, and he will find it in one of two situations: either at the external abdominal ring, or a little deeper seated, on a level with the transversalis abdominis muscle. If at the former part, it is to be divided as before directed; but if the stricture is produced by the tendon of the transversalis its fibres are to be divided upwards and inwards, this being a direction most opposite the course of the epigastric artery. The rule before given is here also to be kept in mind: that the division of the stricture is always to be made without the neck of the hernial sac.

In relation to the course to be taken for dividing the stricture in inguinal hernia, it will be right to transcribe what Sir A. Cooper has said upon the subject. He has recommended as a general rule, for the accomplishment of this purpose, in all inguinal herniæ, that the cut shall be made upwards, lest there might happen to be a doubt in the mind of the surgeon, as to the species of the disease; and by cutting upwards and outwards in a direct, or upwards and inwards in an oblique inguinal hernia, he might wound the epigastric artery, and be the cause of the death of the patient. To be sure, the incision required to be made for the division of the stricture in any hernia, is so small, that cutting upward in all cases for a little extent will never endanger the epigastric artery. But I would not have it understood that the author whom I shall quote on this point, ever intended that he would operate in that way himself, or that he was ready with an apology for a surgeon who should undertake operations for hernia, who could not discriminate among the species of the complaint, or who had not taken the trouble to make himself acquainted with the anatomy of the groin.

“If the operation for this variety of hernia be performed in the manner usually advised in bubonocele, that is, by dilating the hernial sac and stricture upwards and outwards, the epigastric artery will certainly be divided. It has therefore been recommended to alter the direction of the dilating incision to upwards and *inwards*, to avoid the epigastric artery; and if the surgeon is certain as to the species of hernia, that is the safest place. But if in some instances the operator is directed to make the incision in one way, and in others precisely the reverse, there will always be reason to fear some mistakes in practice which would be attended with the most serious consequences: such mistakes, it is true, would hardly occur to a surgeon constantly in the habit of dissection; but to the greater number, the distinguishing marks of the two species will not be sufficiently discriminative. It is therefore desirable to point out such a mode of operating as would ensure the safety of the patient, whatever kind of hernia was found. Such are the advantages possessed by the method of making the incision directly upwards, opposite to the middle of the hernial sac, for in this direction the epigastric artery is certainly avoided."*

THE OPERATION FOR INGUINAL HERNIA IN THE FEMALE.

When this operation becomes necessary, it is to be proceeded in, in the same manner as in the male; but the same coverings are not to be met with to the hernial sac. After the tumour has escaped the external abdominal ring, and becomes placed in the labium pudendum, the operation must be entered upon with great care, as the coverings to the tumour are few, and very slightly thickened. The incision will be commenced against the ring, and carried along the labium for the extent of the swelling. This will divide the common integuments, and expose the peritoneal sac, covered by the process of superficial fascia sent from the external ring. This must also be carefully opened, as directed in the previous description. After this, the sac will be entered into with a probe pointed bistoury, and a director, as before advised. The division of the stricture will be effected in the same manner as in the male. The round ligament of the uterus will here occupy the place of the spermatic chord, and will not be at all in the way.

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* A. Cooper on Inguinal Hernia, p. 52.

THE OPERATION FOR CONGENITAL HERNIA.

The structure of this hernia it will be remembered, differs from the common inguinal only in this circumstance: that the tunica vaginalis occupies the place of the peritoneal sac: the operation therefore, will be performed in the same manner, with however, this slight variation—that let the hernia be of what size it may, the incision into the tunica vaginalis should not be beyond a little above the situation of the testicle; because, if it was cut as far down as the bottom of that organ, the testicle might participate in the inflammation which would be necessary to heal the parts, and much irritation be the consequence, as is sometimes experienced from the method taken to obliterate the cavity of the tunica vaginalis for the cure of hydrocele.

It is thought that in the case of congenital hernia, it is good practice to return the parts without opening the tunica vaginalis; or if it has been irreducible, to divide the stricture and leave them down. The reasoning on this subject is contained in the note below.*

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* "If the congenital hernia is large, and more especially if it has been for any length of time irreducible, I should advise the return of the parts without inspection, if the stricture can be removed without opening the tunica vaginalis. In Plate XI. fig. 3, will be seen a long existing congenital hernia, which had been of very large size, and the abdomen much contracted. In the attempt to return the intestine it burst; the fæces were discharged through the opening at which the bougie was introduced; and the man survived only a few days.—But there is still a greater reason for reduction without opening the tunica vaginalis, if the intestine has contracted an adhesion to this membrane. I know of no operation in surgery so difficult, as that of detaching a congenital hernia which is closely agglutinated to the tunica vaginalis. The adhesions are too short to be cut through; the tunica vaginalis cannot be returned into the cavity of the abdomen; nor can any portion of it be cut away at its posterior part, without endangering the spermatic vessels. All these difficulties are removed by dividing the abdominal ring and transversalis muscles, without opening the tunica vaginalis; or, if this proves insufficient, which is rarely the case, the tunic should only be opened at the abdominal ring, or at the upper orifice into the abdomen, whereon the stricture exists, and dissected so as to get from the strangulation; after which the edges of the wound should be brought together and united by the first intention. The strangulating compression being thus removed from the viscera, they still remain in the same situation, and irreducible, and must be permanently supported by a bag truss."—*Cooper on Hernia.*

THE OPERATION FOR FEMORAL HERNIA.

This is an operation which will require some dexterity on the part of the surgeon; and it will also be more to his credit to succeed in it than in the ordinary forms of the disease. The tumour becoming strangulated generally, when it is small, and the place at which the neck is strictured being deep in the upper part of the thigh, are circumstances giving rise to difficulties only to be surmounted by one intimately acquainted with the anatomy of the parts.

He will commence his first incision above the tumour, and carry it perpendicularly downwards over its centre, and cross this at its lower part by a transverse cut under the base of the hernia, so that the two shall be in the form of the letter T inverted. By this an opportunity will be given to turn up two flaps of common integument, which being done by a careful dissection, to an extent that the whole tumour may be exposed, the fascia superficialis will next appear. This, from femoral herniæ being seldom very large, and also because they are not oftentimes of long standing before strangulation comes on; will not be found so thick as in scrotal hernia, and therefore it is generally cut by the first incision, and brought off the tumour with the common integuments. When it remains on the swelling, and is evident, it is to be removed by a bistoury and director, first pinching it up, that it may be entered without wounding the parts below.

The fascia propria of the femoral hernia will now be presented. This is to be divided as the last, and the incision will extend from the neck to the fundus of the tumour. This covering is the one formed by the projected cribriform portion of the crural sheath. The hernia covered by peritoneum, having descended the sheath of the femoral vessels, makes its way through the reticular membrane lying between the inguinal vein and the inner boundary of the sheath. Some of this is thrust forward, so that when the fascia propria comes in view, some adipose substance is found lying between it and the hernial sac. This will be observed to give the peritoneal sac a rough appearance, resembling the surface of omentum, and for which it might be mistaken. Sir A. Cooper gives as his opinion, that this is the most difficult part of the operation, inasmuch as the fascia propria is very likely to be mistaken for the hernial sac; so that when it is divided, this cellular substance may be considered as the hernial contents, the stricture is then divided without the sac, and the intestine still strangulated, is pushed up within the cavity of the abdomen. In his work he gives a view from a preparation in his possession, wherein the strangulated intestine from this mistake was returned within the abdominal cavity, which of course brought on the death of the patient.

The hernial sac is next to be opened; and this is to be done in the most cautious manner possible, as the tumour is very tense, and generally filled altogether with intestine, there being seldom omentum within a femoral hernial sac. And moreover, much fluid is not to be expected within the peritoneal sac of a hernia of this kind. Sometimes it is entirely absent, and instead thereof, the intestine is coated with a thin layer of coagulated lymph, although there be no adhesions within the sac. Pinching up the sac then, with the thumb and finger, or with a pair of dissecting forceps, it is to be entered by a side cut with a common scalpel; and then by a bistoury and director, the operation of opening the sac is to be completed.

The next thing now to be done, is to ascertain the seat of stricture—and it will be found to be produced by one of three parts:—

The edge of the falciform process of the fascia lata has been found to bind down the neck of a femoral hernia, and produce strangulation. This is easily got rid of, by cutting it in any direction, after a bistoury has been insinuated between it and the anterior part of the sheath of the femoral vessels.

The orifice at the side of the crural sheath, or the circumference of that part from which the fascia propria began to be formed, is in very small herniæ, the seat of stricture. This is easily divided, by passing the bistoury into the sheath without the hernial sac, and cutting a little upwards towards the crural arch.

But when the contents of the hernia are not freed by such a division, the stricture will be found to be produced by the crural arch; beyond which I believe a hernia cannot effect the dilatation of parts.

Some discussion and difference of opinion have obtained among surgeons, in regard to the direction the knife should take in the division of this part, which I consider the ultimate seat of stricture in femoral hernia. M. Gimbernat, a Spanish surgeon, who has given a description of the broad insertion of poupart's ligament, and considering this to effect the stricture in femoral hernia, has recommended that it should be divided along the edge of the bone, or directly inwards, to relieve the neck of the hernial tumour. This method Mr. Lawrence and Mr. Colles have also recommended, but without, in my opinion, sufficient reasons for electing the practice: and Sir A. Cooper has found it best to divide the part obliquely upwards and inwards—his reasons for which, he has given in a separate chapter for the purpose, in the second part of his work on hernia. His arguments are founded upon the difficulty of dividing the stricture towards the pubis from the depth of the parts; from the intestine being in the way in that situation, and from it having been wounded from dividing towards the pubis, of which he gives instances;—from insufficient room being given after dividing towards the pubis, to return the protruded parts; and from the incision upwards and inwards being less likely to wound the obturator artery.

Mr. Hey, during his long practice, adopted the method of cutting in the direction towards the umbilicus. Although what he had said upon this in the first of his Surgical Observations has been misconstrued, yet he fully explains himself in his second edition.

From what I have seen of this disease, and from all that I can conceive of this form of the complaint, I believe that whenever intestine is protruded, from the particular structure about the crural aperture, the gut will be found occupying the hernial sac in one uniform relative situation: and we accordingly find the curve of intestine laying in a horizontal or transverse direction, below poupart's ligament. Thus the intestine is bulged towards the tuberosity of the pubis, as well as against the femoral vein. From this circumstance, it would be difficult to introduce the knife so that the stricture might be divided towards the tuberosity of the pubis, without endangering the gut: and even if the surgeon was to draw it away to make room for the instrument, it would be likely to fall upon the edge of his knife by slipping from his fingers. At the upper part of the gut however, between the two folds, there is a crease made by the doubling of the intestine within the sac, on which the finger can be conveniently laid to guide the knife in the division of the crural arch upwards and inwards. I therefore consider this the best course to be pursued in reference to the safety of the intestine.

There is yet another motive which would lead us to follow the plan proposed, and this has relation to the obturator artery. It has been remarked, as the result of much inquiry and observation, that it is a question yet to be decided, from which source the obturator most frequently takes its rise: whether it is of more constant origin from the internal iliac or from the epigastric artery. I believe it is at least coming off as often from the epigastric as from the previously named trunk; and since we have always to hold in mind such a distribution of vessels, it is for us to inquire in what direction the crural arch can be cut, by which the obturator artery is most likely to be avoided. Now I will affirm, that in the generality of instances, when the obturator comes off from the epigastric, it takes a most ready passage towards the obturator foramen, over the brim of the pelvis. In this course we find it to dip soon after its origin, and to follow the body of the pubis and the linea ileo pectinea, without taking any other tortuous direction. From constant dissection for the last ten years, I have observed this circumstance, and believe it must be a rare occurrence for a femoral hernia to insinuate itself between this artery and the bone as it passes through the crural aperture. If this is granted, and it should also be the fact, that the obturator artery comes off as frequently from the epigastric as I have stated, then it is evidently dangerous to divide the stricture in femoral hernia along the edge of bone towards the spine of the pubis; or in other words, directly inwards. The direction upwards and inwards would therefore be adviseable also from this circumstance.

With respect to what might be said upon the operation for the varieties of femoral hernia, I have only to add, that a surgeon will not always meet with a fascia propria to the protrusion through the crural aperture. This will lead him to be always particularly cautious in conducting the operation after he has divided the common integuments.

Much more might be said upon the subject of hernia, and of the circumstances that may from time to time claim the attention of the practising surgeon. For information upon these points, I shall refer to the works of Sir Astley Cooper, Messrs. Lawrence, Scarpa, Camper, and others; and will retire from this subject, contenting myself with having directed the attention of the American Student to the Surgical Anatomy of the Groin.

THE

RELATIVE ANATOMY

OF THE

Iliac Arteries,

WITH A METHOD FOR SECURING THEM BY LIGATURE.

ANATOMY

OF THE

Iliac Arteries.

CHAPTER I.

THE RELATIVE SITUATION OF THE AORTA A LITTLE BEFORE THE BIFURCATION, AND THE COURSE OF THE ILIAC ARTERIES.

The Abdominal Aorta takes its course by the left side of the duplicatures of peritoneum that form the mesentery, being situated on the forepart and a little to the sides of the bodies of the lumbar vertebræ. Opposite the centre of the body of the third lumbar vertebra the aorta sends off from its forepart the inferior mesenteric artery; and at about one inch and a half below this, opposite the inter-vertebral substance connecting the fourth and fifth lumbar vertebra, is the angle of its bifurcation. This part of the aorta lies immediately before the fleshy attachment of the psoas magnus to the side of the bodies of the vertebræ, so that the left iliac has its course on the inner and forepart of that muscle as far as the crural arch.

The Abdominal Cava takes its passage on the right side of the lumbar vertebræ, opposite the corresponding fleshy connexions of the right psoas muscle, and has its bifurcation about an inch lower than that of the aorta, the angle being placed against the lower edge of the body of the fifth dorsal vertebra.

THE RELATIVE SITUATION OF THE ILIAC ARTERIES.

The Common Iliac Artery at the left side is about two inches in length, and terminates opposite the base of the sacrum, by dividing into the external and internal iliac arteries. The common iliac of the right side takes a course over the vena cava at its bifurcation, and is about three inches in length, in consequence of having to pass from the left to the right side, that it might divide against the base of the sacrum opposite the situation of the former vessel.

The External Iliac of each side, then passes over the inner and forepart of the psoas muscle, lying upon the fascia iliaca, in somewhat of a curved direction, along the brim of the pelvis, to pass under the crural arch, midway between the spine of the ilium and symphysis pubis. This artery is in a considerable degree connected to the fascia over which it runs, while the peritoneum lining the back part of the pelvis is very loosely lying upon it. This artery gives off a few inconsiderable branches, that are distributed to the peritoneum, psoas muscle, corresponding vein, and lymphatic glands, until it is about to pass to the thigh, where the epigastric and circumflexor ilii arteries are seen to arise, as they have been before described.

The Common Iliac Vein of the left side has passage within the artery until it also bifurcates at the base of the sacrum, when the external iliac vein of this side continues to the inner edge of the artery until it passes under the crural arch. The common iliac vein of the right side proceeds from the bifurcation of the cava, above and to the outer side of the corresponding iliac artery, and at the base of the sacrum passes under the artery, being crossed by it, that it may as the external iliac vein of the left side, have a course to the inner edge of the artery, and pass in the same relative situation under the crural arch.

The Internal Iliac Artery of each side comes off from the main trunk opposite the bird's head's or ileo-sacral articulation, and takes its course down the back part of the cavity of the pelvis, lying on the anterior surfaces of the transverse processes of the sacrum.

The Internal Iliac Vein takes the same route with the artery, being given off from its main trunk opposite the origin of the latter.

The Spermatic Vessels, from their high origin, descend at the back part of the abdomen, in somewhat of a tortuous direction, and coming down on the outer side of the psoas muscle, take their course towards the internal abdominal ring, to enter into the composition of the spermatic chord. In their passage they have very loose connexion with the parts behind, but are firmly connected to the peritoneum lining the posterior parietes, and are lifted with it when it is detached.

The Ureter, in its passage from the kidneys, runs inward towards the brim of the pelvis, crosses the upper part of the psoas muscle, and then the common iliac artery and vein, just before these vessels divide into the internal and external branches; and in this way it finds a course to the side of the urinary bladder, behind the peritoneum. This duct is likewise in more firm adhesion to the peritoneum than it is to the parts which form its bed; and it is readily raised whenever we attempt to lift that membrane.

The Peritoneum, as it is concerned in the operations we are about to consider, will be found to be very loosely connected with the whole of the posterior abdominal parietes, up from poupart's ligament, but lining the abdominal muscles it is differently attached. At the forepart of the abdomen it will require a very nice dissection to remove it, but behind, the finger will detach it with much ease, and effect its elevation without any injury to its substance.

CHAPTER II.

THE OPERATIONS FOR SECURING BY LIGATURE THE ILIAC ARTERIES.

Among the achievements of modern surgery, the operations for restraining hemorrhages, and altering the channel of blood for the cure of aneurisms, by placing ligatures around the large arteries, deservedly claim a high rank. For these improvements we are indebted to Mr. Abernethy, Sir A. Cooper, Professor Scarpa, Mr. Freer, Mr. Travers, and to Mr. W. Stevens of Santa Cruz; but especially to Mr. John Bell, whose impressive remarks upon the powers of the system, in getting up new a circulation through the means of the anastamosis of smaller arterial branches, have done much to establish this department of surgery.

The plan which I shall propose, to enable the surgeon to get at these vessels in the living subject, will, I think, be accepted by all who will take the trouble to reflect upon the structure of the parts. An important fabric is to be disturbed in accomplishing this design, and more or less of violence must be incident to the parts within the abdominal parietes.

When these operations are attempted for the cure of aneurism, there is no sufficient reason generally speaking, why they should prove fatal. Yet such has been the case, and may occur again, if an unrestrained use of the knife is resorted to. I think a rule may be established which will regulate in these cases, and comprehend all that is to be feared from the mere operations.

First then,—As the unfortunate instances referred to the operation, and where death has soon followed the performance, have been attributed to peritoneal inflammation, from injury done that membrane;—it would be right so to direct the process that the peritoneum may be as little disturbed as possible:—And

Secondly,—Since we are not without cases wherein hernia has followed these operations, by protrusions taking place at the parts where the openings were made into the abdominal parietes;—it would be proper that the incisions through the abdominal muscles should be made as nearly as practicable in the course of their fibres, and to an extent not greater than would enable the surgeon to get at the artery.—Keeping these principles in view, I shall proceed to describe

THE OPERATION FOR APPLYING A LIGATURE TO THE EXTERNAL ILIAC ARTERY.

The patient is to be placed upon a table, as for the operation for hernia, and his groin being shaved, the surgeon will proceed with a scalpel, to make an incision through the common integuments, commencing at about an inch from the anterior superior spinous process of the ilium towards the pubis. This incision will be carried for a little short of three inches in length, in a line about half an inch above, and nearly parallel to poupart's ligament; its inner extremity taking a slight curvature upwards, that it may end over the spermatic chord as it passes through the external abdominal ring. The integuments will be dissected downwards, until in a line with the ligament, then upwards for about an inch, throughout the whole course of the incision. By this the tendon of the external oblique muscle is to be cleanly laid bare, and afterwards divided for two inches and a half in the direction of its fibres, the incision terminating a little short of the external abdominal ring. This cut will also take a course about half an inch above poupart's ligament. The tendon is now to be elevated by the handle of the knife, from off the internal oblique muscle, so that the oblique canal may be clearly exposed. This will be found of easy accomplishment, for it is only connected to the parts below by a very delicate reticular membrane, which can be readily broken through.

The spermatic chord will now be seen taking passage towards the external ring, from under the edge of the internal oblique muscle, about two inches from the pubis. This part is to be lifted on the finger in order that its sheath, the cylindrical process of fascia which proceeds from the ring, may be opened. This will be done by lifting the pellicle with a pair of dissecting forceps, and then cutting slightly with scissors or scalpel. When this is accomplished, the little finger of the right hand will be passed into the opening, and the sheath will direct it to the internal abdominal ring, immediately behind which, will be felt the pulsation of the external iliac artery.

The peritoneum will not be found much in the way in this operation. Pressing against its angle with the finger a little, will elevate it sufficiently to allow of the artery being secured. It will be remembered that this membrane leaves the anterior abdominal parietes some little way above poupart's ligament, to turn upon the iliacus and psoas muscles and the iliac vessels. It therefore takes a free course at this part, and does not make an acute angle with itself, as it would if it was continued down, before and behind, to be attached to the back edge of poupart's ligament.

An aneurismal needle of silver being now introduced through the internal abdominal ring, it will be insinuated under the artery from its outer side, and moved a little below, that the vessel may be separated from the fascia iliaca, with which it is pretty firmly connected ; as well as from the iliac vein to which it is also attached. The artery will now be elevated through the ring. This will be accomplished more readily by raising the thigh towards the abdomen, and then a silken ligature of sufficient size is to be passed through the eye of the instrument, that it may be drawn under the vessel. The artery will now be tied above the going off of the epigastric and circumflexor ilii vessels, and the ligature, when the part is dressed, is to be allowed to remain without the external wound. One or two interrupted sutures may be applied through the integuments; and when a slight compress and a bandage have been added, the patient may be put to bed.*

THE OPERATION FOR APPLYING A LIGATURE TO THE INTERNAL ILIAC ARTERY.

To accomplish this, the preliminary steps will be the same as in the foregoing operation. An incision in the same manner, and for a like extent, is to be made through the common integuments, and afterwards one through the tendon of the external oblique muscle, as before pointed out. That tendon being elevated by the handle of the knife, I would recommend that the internal oblique and transversalis muscles be detached from poupart's ligament as far up till within about an inch from the anterior superior spinous process of the ilium. This can be done by cutting upon a director insinuated between these muscles and the fascia transversalis. The muscular fibres will without doubt, in the living subject, immediately upon their division contract, at least sufficiently to expose the fascia. The situation of the internal abdominal ring will now be ascertained as in the former operation; and after the finger has been placed within it, the fascia transversalis is to be divided by a bistoury, as far outwards from the ring as the muscles have been separated from poupart's ligament.

An opening now from between two to three inches long, will have been made above poupart's ligament, of which the inner margin of the internal ring will be the boundary towards the pubis. Through such an opening there will be found convenient access to the internal iliac artery.

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* This method for taking up the external iliac artery I have seen practised by Sir Astley Cooper, and in that way I have twice performed the same operation in the living subject. I was pleased to find how much could be accomplished after the tendon of the external oblique was cut through, without the use of a cutting instrument. It is necessary however for me to state, that my two cases terminated unfavourably, from the circumstance of their being in both instances connected with comminuted fracture of the thigh bone, which extended within the cavity of the hip joint; the operations being performed for the purpose of restraining hemorrhage which attended sloughing, the consequence of the injury; but they had the effect of prolonging the lives of the patients, in the one instance for twelve, and in the other for eighteen days.

The handle of a knife or the fingers of the surgeon are now to be employed to burrow under the peritoneum, in order that it shall be elevated as far as that part of the vessel it shall be the surgeon's intention to enclose within the ligature. An aneurismal needle armed with silken thread and of a very short curve will next be introduced while the peritoneum is supported, and passed around the internal iliac artery. The thread can then be drawn through by a blunt hook, after which the needle may be removed.

To tie the ligature in this situation, it will be necessary to make use of the instrument employed in applying ligatures to the tonsils. It is to have one of the threads passed through its end, when the knot can be easily made, while the other is drawn by the hand of the surgeon. This being accomplished, one thread will be cut off close to the artery, and the other allowed to hang out of the external wound. The parts are to be drawn together as in the former instance, and bandages applied.

THE OPERATION FOR APPLYING A LIGATURE TO THE PRIMITIVE ILIAC.

This operation is to be conducted in all respects as the preceding, with the exception that the iliac extremity of the incision through the abdominal parietes, will be continued up as far as the anterior superior spinous process of the ilium. This will be extensive enough, as there will then be an opening of about four inches in length, and amply sufficient for the introduction of a ligature around the common iliac artery, as I have often tested in the dead subject.

Explanatory of this division of the subject there is accompanying a plate, which is the fifth in the series. It shows a ligature about these vessels, at situations in which they had been applied after the arteries had been found by prosecuting the dissection as recommended.—After the time that I had operated in the living subject for the external iliac, I have frequently dissected in order that I might ascertain which should be the most ready and safe method to secure the common and internal iliacs. Being fully satisfied with the manner

I have prescribed, I took occasion this winter to submit my plan to Professor Mott, just as he was about to enter upon that part of his course in the College. He had not previously made the experiment, and began it before his class with some little uncertainty as to the result. He commenced in the manner I have suggested, and was soon well convinced of the practicability to secure these arteries in that way; expressing himself delighted with the facility and safety with which these operations could be performed, especially in reference to the peritoneum. I therefore took occasion to have the drawing of Plate V. prepared from the subject he operated upon. The three ligatures referred to were those which he applied, and their situations have been correctly delineated by Mr. Durand. The opening in the parietes is also seen, which extended outwardly barely as far as the anterior superior spinous process of the ilium.

When we compare the manner of operating with that which has been sometimes practised, I think we shall be at no loss to which to give the preference: especially when we are informed that hernia has succeeded to the extensive divisions that have been made through the walls of the abdomen, for the purpose of securing these vessels.

Mr. Abernethy's method was to cut perpendicularly upwards from poupart's ligament, for the extent of three inches, for the purpose of getting at the external iliac artery, by which an opportunity was given for great muscular contraction, from the fibres of the three muscles being cut almost at right angles with their course. This must have exposed the peritoneum to considerable extent, from which much injury to that membrane might be anticipated. Accordingly, as far as I can discover from the description of Mr. Abernethy's two first cases, they both terminated fatally from peritoneal inflammation.

Although this evil may be surmounted by a careful after treatment, yet it is hardly to be expected that the abdominal parietes will ever be sufficiently firm to support the contained viscera. A case is recorded by Mr. John Kirby, Lecturer on Anatomy and Surgery in Dublin, wherein a man by the name of Dennis Healy, was admitted into St. Peter's and St. Bridget's Hospital, for the purpose of undergoing the operation, for the cure of an aneurism in the left groin. This was judged a fit opportunity for tyeing the external iliac artery, and we find Mr. Kirby, assisted by his colleagues, "made an incision nearly four inches long, through the abdominal integuments, directly over the external iliac artery, commencing about an inch above poupart's ligament. The muscles were divided with facility, a director being passed under each, in the manner described by Mr. Abernethy." Through the fascia transversalis he "made an orifice sufficiently large to admit a director, by which its further division was easily and securely accomplished; the peritoneum was readily detached from its connexions, and was pressed with the viscera towards the opposite side." One ligature only was placed upon the artery, and the wound was dressed with a view to a union by the first intention. The record states, "Jan. 30, 1812," being about two months after the operation, "the tumour is nearly unaltered in bulk; it is very firm, and may be handled without pain. His general health is so much established, that he is no longer a subject for residence in a hospital." But the same record continues with this remark: "August 1, 1818.—Healy still lives. A hernia prevails where the abdominal muscles were divided. The arterial system seems to be free from aneurismal disease."

Mr. W. Stevens, Surgeon in the island of Santa Cruz, on the 27th Dec. 1812, affixed a ligature upon the left internal iliac artery, for the cure of an aneurism that had its situation over the ischiatic notch. It was nearly as large as a child's head, and pulsated strongly. The patient was much reduced, and gave a ready assent to the operation.

I shall sketch from the fifth volume of the Transactions of the Medico-Chirurgical Society of London, as much of the case as has reference to the performance of the operation, in order that the reader may have the opportunity of discussing in his own mind, the best method for getting at the artery; which he will be led to do when he shall have been made acquainted with the present state of the patient.

"An incision about five inches in length, was made on the left side, in the lower and lateral part of the abdomen, parallel with the epigastric artery, and nearly half an inch on the outer side of it. The skin, the superficial fascia, and the three thin abdominal muscles, were successively divided; the peritoneum was separated from its loose connexion with the iliacus internus and psoas magnus, and then turned almost directly inwards, in a direction from the anterior superior spinous process of the ilium, to the division of the common iliac artery. In the cavity which I had now made, I felt for the internal iliac, insinuated the point of my fore finger behind it, and then pressed the artery between my finger and thumb. Dr. Lang now felt the aneurism behind, the pulsation had entirely ceased, and the tumour was disappearing. I examined the vessel in the pelvis;—it was healthy, and free from its neighbouring connexions: I then passed a ligature behind the artery, and tied it about half an inch from its origin. The tumour disappeared almost immediately after the operation, and the wound healed kindly. About the end of the third week the ligature came away, and in six weeks the woman was perfectly well."

"I found no difficulty in avoiding the ureter—when I turned the peritoneum inwards, the ureter followed it. Had it remained over the artery, I could easily have turned it aside with my finger."

I have now to add, upon the first medical authorities of this city, that Dr. Scott, a physician of eminence of the island of St. Thomas, while on a visit to New-York, last summer, stated that he had seen Mr. Stevens' patient many times since the operation, and reported that she then laboured under a large hernial protrusion, which had projected through the opening in the abdominal muscles, which was made to get at the internal iliac artery.

REMARKS UPON TYEING THE AORTA.

It will be without doubt considered presumptive for me, to give directions for attacking the aorta with a ligature. Yet I have to say, that if it should be my lot to meet with a case that required this operation, to save the patient from impending death, I would not hesitate to perform it—and in this way I would proceed :

I would commence an incision beginning over the extremity of the last or twelfth rib of the left side, and continue it through the common integuments as far as the anterior superior spinous process of the ilium. Thus I would lay bare the external oblique muscle, which I would divide for the same extent ; this incision would be almost in the course of its fibres. The internal oblique and transversalis muscles I would also divide in the line and to the extent of the first incision. These muscles readily retracting, would expose the fascia transversalis, which part I would lift with a pair of dissecting forceps, and open it as directed in the case of a hernial sac. I would then introduce my finger, and extend its division by means of a bistoury as far as the first cut through the common integuments, being cautious to avoid any injury to the peritoneum underneath. I would after this, elevate the peritoneum from the posterior abdominal parietes, by insinuating two fingers, while I supported with the other hand the part raised, until I had separated as far as the attachment of the mesentery, in the forepart of the lumbar spine. I should now see and feel the artery above its bifurcation, and be able, with a properly curved aneurismal needle, to pass a ligature around it, and draw the knot by the contrivance made use of for the extirpation of the tonsils.

To facilitate such an operation, as remarked in Sir A. Cooper's case, it would be expedient to approximate the shoulders to the pelvis, that the abdominal muscles might be relaxed ; and also, previously, to empty the intestinal canal, that no difficulty should be experienced in elevating the peritoneum, from the pressure of the abdominal viscera.

In Plate V. will be seen a ligature around the aorta, which I applied with much ease by pursuing these steps in the subject that was occupied in the New-York College by Dr. Mott in elucidating the foregoing operations. In lifting the peritoneum, the ureter and spermatic vessels were readily raised with it, and were entirely out of the way while making search for the artery.

By referring to Plate VI. the reader will be presented with very positive proof, that on an artery, one ligature is quite sufficient to assist nature in effectually and permanently closing its canal. I believe that a clot to become a plug to direct the course of blood towards other great branches, is necessary until the process of nature shall be completed in obliterating the vessel—it would be therefore right that an artery should not be tied immediately in an angle of bifurcation: for I am also of opinion, that the mere adhesion of the internal coat which shall have taken place from the time of tyeing until the coming away of the ligature, will not be sufficient to prevent a secondary hemorrhage.

There need be no hesitation in tyeing large arteries from a fear that the parts will not be supplied with blood, or that the vessel may be too near the heart to give an opportunity to anastomosing branches to carry on the circulation: since we are in possession of facts enough to remove apprehensions on this head.

Independently of having recourse to the testimony afforded by dissection, we have numerous living evidences in the human subject that go to prove the powers of the constitution in this particular. The carotid, the subclavian, the external and the internal iliac arteries have been tied with success, and no difficulty has been experienced as retarding the cure in these cases that might be referred to a want from this source. But as we may wish to know the manner in which it is accomplished, it will be right to attend for a moment to some of the *post mortem* appearances which have been observed upon this subject.

Sir A. Cooper has communicated to the Medico-Chirurgical Society of London, an Account of the Anastomosis of Arteries at the Groin, which is published in their fourth volume. The paper contains two cases, in each of which the external iliac artery had been tied for aneurism, high up in the thigh. One of these patients, Garrett Riley, died in ten weeks after the operation, from the bursting of an aneurism at the bifurcation of the aorta; and the other, James Nutter, surviving the operation nearly three years, died of some other complaint in Guy's Hospital, when an opportunity was given for the examination of the limb.

Of the first of these cases it is stated, that upon endeavouring to ascertain the mode in which the blood took its course through the limb, it was found that the femoral, tibial, and fibular arteries were still open, and that the blood was conveyed into the femoral artery by the following anastomosis. The internal pudendal artery formed several large branches upon the side of the bulb of the penis, and these branches freely communicating with the external pudendal artery, had determined the blood into that artery, and by this canal into the femoral: the lateral sacral artery also sent a branch on the iliacus internus muscle into the femoral artery, and the ilio-lumbar artery freely communicated with the circumflex ilii, so that by these three routes the blood found direct ingress into the femoral artery.

Numerous branches of arteries also passed from the lateral sacral to the obturator and epigastric arteries, the obturator in that case having its origin from the epigastric.

Besides these arteries, a free communication existed between the arteria profunda and circumflex arteries with the branches of the internal iliac:—first, the gluteal artery sent a branch under the gluteus medius muscle to the external circumflex artery; secondly, the ischiatic artery gave two sets of branches of communication, one upon the gluteus maximus muscle to the arteria profunda, and another upon the sciatic nerve to the internal circumflex artery; the internal pudendal artery also sent a branch of communication to the internal circumflex; lastly, the obturator freely communicated with the internal circumflex.

In the second case the condition of anastomosis is stated as follows: the internal iliac and femoral arteries were obliterated, except about an inch of the femoral artery just below poupart's ligament, which still remained open, and continued to convey a portion of the blood; but below this part it had become simply a ligamentous chord. The internal iliac artery sent first a very large artery of communication to the epigastric and obturator artery; so that the epigastric was supplied with blood from the internal iliac: secondly, the internal iliac sent an artery of communication upon the sciatic nerve to the internal circumflex artery. The gluteal artery gave a large branch to the origin of the profunda: lastly, the internal pudendal artery largely anastomosed with the obturator: the obturator therefore sprang in this case from two new sources, viz. from the internal iliac and from the internal pudendal artery; and the obturator thus formed, sent two branches of communication to the internal circumflex artery. The arteria profunda was in this case supplied from two sources, directly from the gluteal, and more indirectly from the internal circumflex by the obturator and ischiatic arteries. The external iliac artery was obliterated to the origin of the internal iliac, as the other arteries usually are when ligatures are made upon them to the first large anastomosing vessels.

It appears then, that immediately after a large artery is tied, all branches in the neighbourhood take their part in assisting the new circulation, but after it has become established, and the part relieved from the sudden interruption, that the anastomosing branches are larger and less numerous.

The principal agents then in the new circulation, upon a ligature being applied to the external iliac, are found to be:—the gluteal with the external circumflex, the obturator with the internal circumflex, and the ischiatic, with the arteria profunda; and that when the obturator artery has its origin from the epigastric, it is principally supplied with blood from the internal pudendal.

I am not aware of any instance of the tyeing the common or internal iliac that has afforded opportunities upon dissection of examining into the new circulations. The ability however, of the constitution to effect this by anastomosis, is proved by the instance of the Negro female in the island of Santa Cruz; also by the reports just detailed, as well as by what has been recorded concerning obliterations of the aorta.

There are three instances on record, wherein a free circulation through the canal of the aorta has been interrupted, yet the powers of the constitution have been efficient to the support of life, from the enlargement of the collateral branches.

The first time that such a circumstance was observed, was in the year 1789,* when M. Paris, dissector at the Amphitheatre of the Hotel-Dieu, injected the body of a very lean woman of about 50 years of age. "Upon dissection it was discovered that the aorta immediately beyond its arch was contracted to the size of a writing quill. The coats of this part of the vessel appeared natural, but its cavity extremely small. The arch of the aorta above the contraction was but very slightly dilated, and the part below had lost nothing of its natural size. Nothing could be found either in its own structure, or in the condition of the neighbouring parts, to account for this contraction of the artery.

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* Desault's Surg. Journal, vol. i.

The carotids were in their natural state—the arteria innominata and the left subclavian were enlarged to twice their natural diameter; all these smaller branches were increased in the same proportion, and had assumed a curled and zigzag course. The internal mammary and phrenic arteries were greatly enlarged and very tortuous. The transverse arteries of the neck were twice their natural size; the posterior branches were tortuous, extending to a great distance over the back, with long inosculations, which were met from below by branches of the upper intercostal arteries, and they were also remarkably enlarged—the thoracic and scapular arteries, which run along the side of the chest, were twice their natural size.

Below the constricted part of the aorta, the lower intercostals were remarkably enlarged, even to three or four times their natural size. Each of them was dilated, but those were most affected which were given off near the contracted part; and the posterior branches of each which penetrates to the muscles of the back, were more dilated than that which runs between the ribs: indeed those posterior branches were so remarkably dilated, with contortions so closely succeeding each other, that they resembled a necklace of beads; and their inosculations with the branches of the transversalis cervicis were very remarkable. The lower phrenic artery was enlarged, forming considerable inosculations with the superior phrenic; the epigastric artery was dilated to the size of the enlarged mammary, and was joined with it by very numerous and conspicuous inosculations!"

The next case was one reported from the Glasgow Infirmary, by Dr. Robert

Graham to Sir Gilbert Blane, and by him read before the Medico-Chirurgical Society of London, July 19, 1814.*—In this instance also, the aorta was contracted just beyond its arch. The paper, after giving the previous symptoms and treatment of the patient, which could not be referred to such a state of arterial derangement, proceeds to detail the appearances upon dissection.

"There was nearly a pound of serum in the cavity of the abdomen, and the bowels were distended with flatus, but the viscera seemed natural. Immediately upon turning up the sternum, the pericardium presented itself, very much enlarged, obscuring the left lung, and adhering to the pleura costalis. This capsule which was thin and beautifully transparent, contained about an ounce of fluid and a heart nearly twice the natural size for a boy of this subject's age.† The arteries and trachea were divided above the aorta, the contents of the thorax torn downwards, and the aorta being divided below, the whole was removed from the body. The walls of the left ventricle were about an inch in thickness, but no other derangement in the structure of the heart or its valves was observed. The capacity of the cavities seemed natural. The aorta expanded universally near its origin, so as to form a kind of pouch; but after giving off the branches to the head and superior extremities, its diameter was preternaturally contracted. It was continued of this diminished size, till after its union with the canalis arteriosus, where it was completely impervious. The coats were not thickened, or in any way diseased, except that about half an inch below the stricture there was a smooth elevation on the inner surface, less raised, but having nearly the diameter of a split pea; otherwise the appearance was exactly such as if a ligature had been tightly applied round the artery. The obstruction was about a line in breadth; the artery then received three trunks, about the size of crow quills, and near them three smaller ones, afterwards resuming its natural size along the vertebræ. These three trunks are evidently the uppermost of the inferior intercostals. Their coats were remarkably thin, like those of veins. A probe passed from the pulmonary artery along the canalis anteriosus to the obstructed portion of the aorta; but from its thickened appearance it did not seem probable much communication by means of it could have been allowed, and the florid countenance of the boy during life establishes the same conclusion. There having been no suspicion of this singular deviation from the natural structure till after the contents of the thorax were removed from the body, it was impossible to trace with the accuracy that could be wished, the anastomosing branches by which the circulation had been carried on in the inferior parts of the body; but I think enough has been observed to lead us very near the truth. The arteria innominata, the left subclavian, the superior intercostals, and the mammary arteries, were much enlarged. The epigastric was reported of its natural size. These facts, and the aorta acquiring at least very nearly its natural size immediately below the stricture, show that the blood did not pass to the inferior extremities, in any material quantity, as might have been expected, by the inosculations of the mammary and epigastric artery, but chiefly by the communications of the superior intercostals and the mammary arteries with the three large branches entering the aorta below the stricture: also from the mammaries and thoracics, through others of the intercostal and diaphragmatic arteries.

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* Medico-Chirurgical Transactions, vol. v. p. 287, Lond.

† 14 years.

The third case or record is the one notified by Thomas Goodisson, M. D. of Wicklow, while at Paris, to Surgeon General of the army in Ireland, Dr. Philip Crampton, F. R. S.; and to be found in the second volume of the Dublin Hospital Reports. I shall extract as much of this case as may tend to confirm what the others also have served to demonstrate;—that the channel of blood in the aorta can be directed out of its natural course, and the equilibrium of the circulation maintained through the medium of anastomosis; and this case, I believe, is the only one that can be referred to, wherein the obliteration existed in the abdominal aorta.

Hospice de la Pitie, a Paris, April 1818.

“Upon endeavouring to trace the origin of the inferior mesenteric artery in the body of a female subject which had been brought to this Hospital from the Hotel-

Dieu among many others; I discovered a hard tumour, which, from its situation, puzzled me not a little at first, being directly placed upon the line of the aorta; and which upon more minute examination, I found to be a diseased state of this vessel, which upon still further inquiry, I found to be obliterated from the origin of the inferior mesenteric artery downwards, for the remainder of its length; together with the greater part of the iliacs on each side, the cavity of that on the left side being obliterated to its bifurcation into external and internal, and that on the right to more than one-half of the length of the common iliac.

The artery lay close, and was firmly attached to the spine; it had precisely the appearance of the trachea, being rendered flat upon its posterior surface, but preserving anteriorly its circular or convex form.

The aorta at its arch was considerably expanded, so as to be nearly double its natural size; and if compared with the relative size of the vessels in the extremities of this subject, it might be said to have been fully double. Internally it was studded with gross patches of bone, the principal situation of which was in the neighbourhood of the origin of the vessels supplying the superior extremities. The depositions of ossific matter were interspersed here and there, downwards along the course of the artery; but neither thickly spread, nor of so gross substance, as on the part beforementioned.

Upon tracing the arteries given off from the aorta descendens, the following observations were made:

The intercostal arteries (and in particular that one which takes its course along the last true rib,) were found to be very much increased in size, and formed considerable anastomoses with the mammary artery, which was itself much enlarged.

The spermatic arteries* were immensely increased in size, and their course was rendered very much contorted and spiral, so as to give them a very beautiful appearance, not unlike the convolutions of the injected vas deferens of the testicle.

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* The uterus was in an unimpregnated state.

Their course was consequently easily traced into the pelvis; but the uterus having been previously removed, it became impracticable to pursue them further.

The lumbar arteries which passed between the fourth and fifth vertebræ, were enlarged prodigiously, and had by their constant action, caused an absorption and consequent enlargement of the channel along which they passed.

The sacra media had been obliterated altogether; but its place was supplied with a small vessel which passed behind the diseased part of the aorta, pretty much in the usual course of the sacra media itself;—the origin of this vessel could not be traced by reason of the aorta being removed before it had been discovered.

New circuit of the blood.—The mammary arteries were a good deal enlarged, and, like the spermatic arteries, their course was beautifully marked by the serpentine convolutions which they formed. That of the left side was joined by a considerable branch from one of the intercostals, at the superior anterior spinous process of the ilium. This branch took its usual course from the aorta, passing immediately along the external edge of the psoas parvus one-half of its length, then passing between the transversalis and obliquus descendens, and continuing its course between those two muscles till arriving at the beforementioned point, it joined the mammary or epigastric, together with a branch of considerable size, passing from between the fourth or fifth lumbar vertebra, and another smaller one, which, passing across at right angles, the whole were conveyed together by the medium of the circumflexa ilii, to the usual origin of this vessel in the external iliac.—It is almost needless to remark here, that the circumflexa ilii was considerably enlarged in size; indeed so much so as nearly to equal the size of the external iliac itself.

The supply of the right extremity was very similar to that of the left, except that some little difference existed in the course and relative size of the supplying vessels. Not so however, with respect to the course which the blood pursued after the anastomosis at the ilium on this side.

From this point it was conveyed across the lumbar muscles, by an enlarged vessel, taking nearly the direction of the wing of the ilium, till, having come within an inch of the spine, it made a turn at nearly right angles, and plunging suddenly into the pelvis, it opened into the external iliac a little below the bifurcation. The circumflex ilii of this side did not appear of more than ordinary size. These arteries in their passage across the muscles of the lumbar region on each side, partook more or less of a spiral course, remarked as having existed in that of the mammary and spermatic arteries.

The inferior mesenteric artery at its origin was completely closed. The part of it which remained pervious put on a conical form; the apex of the cone looking upwards. Unfortunately, the intestines had been removed, and with them the remainder of the artery, before the diseased appearance was noticed; and consequently the search for the new mode of supply to the intestines was rendered fruitless. It is to be supposed, that the mesenteric artery received its supply from some of the enlarged lumbar arteries, which could not be traced to any other destination.

The cavity of the left iliac was obliterated altogether, down to its bifurcation into internal and external; the latter of which was impervious much lower down, so far as where it received the new supply.

The right iliac continued pervious about half an inch above the bifurcation, but beyond this there was no appearance of a passage having ever existed."

To this case is added an observation respecting the fine appearance of the subject—that there was nothing from an external view which would lead to a supposition of any thing like such internal derangement; but on the contrary, the subject was remarked as the best, the soundest, and most muscular that had been introduced into the dissecting room during the season. And Dr. Goodisson added, that it was with no small degree of regret, that all his endeavours to trace this woman's case during her stay in the Hospital, or her history previous to her arrival there, proved ineffectual.

Here then, I have given in detail, three instances of obstructed aorta; two in the thorax and one in the abdominal cavity: all of which go to prove, that the important rank which this vessel holds in the vascular system, is no objection to its being included within a ligature.

THE

SURGICAL ANATOMY

OF THE PARTS CONCERNED IN THE OPERATION

OF

LITHOTOMY.

THE

Surgical Anatomy

FOR

LITHOTOMY.

CHAPTER I.

As the operation of Lithotomy in women is very simple, I shall at present omit any reference to the relative structure of parts in that sex, notwithstanding I am prepared to assert, that there is a curiously contrived mechanism in the perineum of the female, which seems hitherto to have been overlooked.

In conducting this description, I purpose to consider the parts under three different heads:—first as they appear from an abdominal aspect; then as they can be traced by dissection per perineum; and lastly, as they are brought under view by a lateral exposure of the parts within the pelvis. In prosecuting it moreover, I shall proceed as if I was tracing the parts in the dead subject.

SECTION FIRST.

ANATOMY OF THE PARTS CONNECTED WITH LITHOTOMY, BY A VIEW FROM THE CAVITY OF THE ABDOMEN.

Peritoneum. Having opened the abdominal cavity, inflated the urinary bladder, and turned aside the intestines; we observe the peritoneum continued over the upper part of the pelvis, having connexion as follows: After lining the anterior abdominal parietes by a very close attachment to the fascia transversalis, it begins about two inches above the pubes to adhere very loosely, being connected below this by very long reticular membrane; so that when the bladder is distended, the peritoneum is drawn away from this part, but without being detached, having merely its loose connecting medium put upon the stretch. It is in this way pushed up by the distended bladder, so as to appear to have come off from the parietes full two inches above the pubes; thence passing immediately upon the vesica urinaria. It is no doubt for the accommodation of the urinary bladder that this membrane is so loosely connected behind poupart's ligament on each side, from which a facility is offered for taking up the artery through the internal abdominal ring, as stated while speaking of the operations upon the iliac vessels.

The peritoneum is seen also passing from the lateral parietes to cover the fascia iliaca, and the great vessels around the brim of the pelvis; and will be observed to pass over the distended bladder immediately from the brim, without dipping into the cavity of the pelvis by the side of this viscus. This membrane however, is extensively attached to the bladder behind, by passing down between it and the rectum, as far as the extremities of the vesicula seminalis of each side, at the *bas fond* of the bladder; and between these two bodies it continues its attachment to the bladder till within an inch of the prostate gland, and then altogether leaves this viscus to be reflected upon the hollow of the sacrum, and having the rectum behind it, gives a covering to the anterior part and sides of that gut. The peritoneum can now be followed from binding the rectum to the backpart of the pelvis, upwards, to where it takes the name of mesocolon.

It will next be observed that the urinary bladder is not completely enveloped in a peritoneal covering; that anteriorly from the fundus downwards, it is without this tunic, and that at its sides it is not covered halfway from above by the peritoneum; but behind it has a more extensive covering from this membrane, extending so near the prostate gland that it is hazardous to perform the operation for tapping the bladder by the rectum, lest the peritoneum should be wounded.

By separating the peritoneum from the iliac and psoas muscles, we observe the iliac vessels taking a course in their way to the crural arch, along the sides of the bladder, a little to the outer margin of the brim of the pelvis, and lying upon the fascia iliaca, where it covers the psoas muscle. These vessels, where they are denominated common iliacs, are crossed by the ureters that pass into the pelvis to terminate at the sides of the bladder, in a situation afterwards to be pointed out. We perceive also the vasa deferentia ascending the pelvis by the side of the bladder in the course of the line of attachment of the peritoneum, and going over the iliac vessels, they find their way through the internal abdominal rings, to enter into the composition of the spermatic chords. By this elevation of the peritoneum, we see the connexion of the bladder to the side of the pelvis; and from the brim, some way downwards, we find a reticular tissue connecting the bladder to this part, which is loose to allow of motion in its several states of distention; and this is slightly interspersed with fat, perhaps to defend the bladder from pressure against the walls of the pelvis.

Ileo-Vesical Fascia. Having observed what was to be seen immediately under the peritoneum, we are now led to give attention to a tolerably dense though semi-transparent membrane, covering the iliacus and psoas muscles, and named fascia iliaca. This will be perceived at the inner side of the crista of the ilium, continuous with the fascia transversalis, and to have boundaries as defined in a former part of the work, while upon the anatomy of hernia. I shall now enlarge upon that description, and describe it as I have traced it in connexion with the urinary bladder.

We accordingly find the iliac fascia after lying under the iliac vessels, passing into the cavity of the pelvis; by going over the brim from the symphysis pubis to the ileo-sacral articulation, on each side. For some way down it has close adhesion to the side of the pelvis; and this is as far as the lower part of the symphysis pubis on its forepart, the hole for the transmission of the obturator vessels and nerve in the middle, and as low as the spinous process of the ischium behind. At a line running from these parts it is reflected inwards to have attachment to the side of the bladder—so that it leaves the side of the pelvis by a semi-elliptic course, convex towards the abdomen. We also find it connected to the side of the urinary bladder by a line of attachment of a similar curvature. This line commences above the situation of the prostate gland, after having proceeded from the upper surface of the membraneous urethra; from these parts it rises upwards in conformity to the nature of the curve which is here also convex towards the abdomen: taking this direction, it reaches the opening in the side of the bladder which receives the ureter, and afterwards has a course downwards and backwards, to end at the extremity of the vesicula seminalis.

There is therefore a loose portion of iliac fascia situated between the side of the bladder and pelvis. This I have called ILEO-VESICAL. It is in breadth anteriorly about half an inch; becoming gradually wider, is opposite the hole for transmitting the obturator vessels an inch and a half: and then getting narrower, is in the neighbourhood of the spinous process of the ischium, less than an inch wide. In looking at the upper surface of this ileo-vescial reflection, we observe that it dips behind the pubis, so that on each side the symphysis there is a pit or pouch, which is of size to receive the end of the finger. This portion of fascia appears at first view to be of tendinous structure, being more dense and of a different texture from the fascia iliaca covering the muscles in the hollow of the ilium; which is owing to a circumstance that does not dispute its continuity with the fascia iliaca, and is to be attributed to the tendinous connexion of a part of the levator ani, that will be more distinctly explained when we come to another part of the dissection.

From this aspect we can see, between the line of attachment of peritoneum to the urinary bladder and that made by the fascia, the muscular coat of this viscus covered by a thin membrane, which is a lamina, (THE SUPERIOR LAMINA OF THE ILEO-VESICAL FASCIA,) sent up by the ileo-vesical fascia; and it is by it that this part of the bladder is supported and made equally strong with that defended by peritoneum. This lamina, by sending a process anteriorly from the bladder to the posterior part of the symphysis pubis, forms an anterior ligament to the bladder, which becomes a partition by dipping between the anterior connexions of the ileo-vesical fascia; and fixing itself to the upper part of the membraneous urethra, aids in forming the two pits or pouches referred to in the last paragraph.

From this view of the parts, there can be also observed a deep pit behind the bladder, bounded by this fascia, and occasioned by the particular dipping of its posterior part. Into this urine might find access in the high operation for stone; whence I know not how it could be extricated. Into this also I believe extravasated urine finds a place from the lateral operation by the gorget, in consequence of the manner in which this instrument is sometimes introduced, as shall be noticed when we come to another part of the subject.

It can moreover be observed at this stage of the dissection, how the peritoneum, as it passes to the rectum, has its angle of reflection just where the ileo-vesical fascia ceases to have attachment to the posterior part of the side of the bladder; so that it becomes the upper and posterior boundary of this bag into which the urine is likely to fall, from the unguarded use of the gorget in lithotomy. It will now be perceived, that urine thus situated, in however small a quantity, will be in contact with the outer or under surface of this highly sensible membrane. If this is substantiated, I think we have a ready solution to those cases of death after the operation of lithotomy found upon record, and involved in mystery, not having attached to them any rational explanation for the fatal event.

SECTION SECOND.

THE ANATOMY OF PARTS CONCERNED IN LITHOTOMY FROM DISSECTION BY PERINEUM.

A careful examination into the structure of the perineum must be attended with the best results to the surgical practitioner. Independently of being unable to think aright of the operation of lithotomy, he is totally unqualified to treat with success those numerous ills occurring in this situation; unless he shall have spent much time and labour in attending to the structure of these parts. The difficulties experienced by practitioners in general, in the mere introduction of the catheter, is enough to convince of the intricacies of the parts about the perineum, while the very many inexplicable fatal results from the operation of lithotomy, together with the frequent new modelling of instruments for its performance, unattended for the most part with the anticipated benefits; are additional proofs that there was something yet to be learnt concerning the anatomy of this part of the pelvis.

Having placed the subject in the situation directed for the operation of lithotomy, and raised the scrotum, we perceive the appearance put on at this part by the common integuments. We observe a line or raphe passing from the backpart of the scrotum to the forepart of the anus. This divides the perineal space into two lateral portions, and is a mark by which can be regulated the first incision in operating for stone.

We are now to dissect away the common integuments of the perineum, which we find with little fat, as they cover the bulb of the urethra and edge of the anus; but where they are placed over the tuberosities of the ischia, and towards the glutei muscles, they are abundantly supplied with this substance. Here it is generally an inch thick in what otherwise might be called lean subjects.—Thus in commencing the operation of lithotomy, the arterior part of the first incision need not be carried deeply to pass through the skin of the perineum; but as the cutting advances backwards it necessarily must be deep to prepare for the next incision.

The Fascia of the Perineum. After the integuments are dissected away, we have brought to view a covering from fascia extending over the whole perineum, and stretched across the arch of the pubis as far as the tuberosities of the ischia; then backwards extending to the posterior boundaries of the outlet of the pelvis. This substance is more dense than the fascia superficialis at any other part, and as firm as the fascia lata of the thigh: it is closely connected with the bony boundaries of the outlet, and has been thought to be a continuation of the fascia lata, but it is no doubt more properly to be considered a portion of the fascia superficialis; that general covering found every where under the common integuments. Its greater thickness here is to be accounted for from the motion of this part, as well as from the incumbent weight, especially in the erect position of the body.—The resistance given by this fascia to collections of matter in the perineum is why the sinuses proceed so far up by the side of the rectum, before they find an outlet externally by the ulcerative process; and its density moreover, should be kept in mind in reference to the operation of lithotomy; as a free incision into this part would be expedient, to facilitate the extraction of the stone, as well as to prevent the infiltration of urine behind the common integuments of the perineum.

MUSCLES OF THE PERINEUM. The fascia is now to be removed by a very cautious dissection; to prepare for which, it would be right to fill the end of the rectum with sponge, that the fibres of the sphincter might be put upon the stretch; and an instrument may be introduced into the urethra, for the purpose of distending the bulb. After the simple fascia shall be lifted, the muscles will be found still obscured, from being plentifully covered with cellular membrane under this covering. To remove this, some care with the scissors and forceps will be required, that their connexions may be distinctly seen.

At length the dissector will have brought to his view the muscular fibres of the perineum, which he will find variously disposed; and his next step will be to arrange them in his mind in relation to the operation of lithotomy.

To facilitate this object, let him imagine a line drawn transversely between the two tuberosities of the ischia. This will divide the bony outlet of the pelvis into two triangular spaces, which will be almost equilateral in the male subject. The anterior division is to be considered as bounded by the rami of the ischium and pubis on each side, as far up as the angle of junction of the symphysis, and by the imaginary line drawn between the tuberosities of the ischia. And the posterior division as bounded, also, by the imaginary line; with other lines running from the tuberosity of the ischium on each side, to the extremity of the os coccygis:—which last are occupied by the inferior boundaries of the two great glutei muscles.

He will now perceive all the muscular fibres except those of the erectores penis, to converge toward the centre of the anterior triangular division of the perineum, and to be affixed to each other by the intervention of a white ligamentous spot, which I have found to be a projected point from the middle of the lower edge of the triangular ligament of the urethra; and which I have taken upon me to call THE CENTRE OF UNION OF THE MUSCLES OF THE PERINEUM.

In the centre of the posterior division will be seen the opening of the anus.

It will be in place now, to trace the connexions of the muscles at this part; and afterwards the use they serve in the animal economy.

Erector Penis *Arises* tendinous and fleshy from the inner part of the tuberosity of the ischium. It runs upwards increasing in breadth, surrounding the crus penis, except where it lies against the bone; and is *inserted* by a thin tendinous expansion into the ligamentous covering of the crus, just before it unites with its fellow to form the body of the penis.

Accelerator Urinæ *Arises* tendinous from the ramus of the pubis under the crus penis, as far nearly as the symphysis; and where the crura join, fleshy fibres are seen to come from the outside of the corpus cavernosum penis. Having an origin of about two inches in extent, all the fibres soon become fleshy, and run downwards and backward, parallel to each other; and being loosely connected to the parts underneath, meet their fellows at acute angles, that point towards the anus; to be *inserted* into the ligamentous point of union of the muscles of the perineum, and into a white tendinous line of about two inches in length, their own production; and placed along the middle of the lower part of the bulb of the urethra. Thus we have the posterior edges of these muscles surrounding the bulb, lying upon the anterior surface of the triangular ligament.

Sphincter Ani. This muscle is seen extended on each side the end of the rectum, from the extremity of the coccyx forward, to the centre of union for the muscles of the perineum. It is not a muscle composed of circular fibres as are some of the sphincters; but of two flat bands, one passing on each side of the gut toward the points of attachment just mentioned. These bands are broad in the middle, where the fibres are spread by an interlacement of those of the levator ani of each side, but pointed at their extremities, to meet their places of attachment.

TRANSVERSALIS PERINEI *Arises* on each side, from the inside of the tuberosity of the ischium. The fibres pass downwards and forwards across the perineum, taking the course of the lower edge of the triangular ligament, and meeting each other, the two muscles from an obtuse angle, and are *inserted* into the back part of the central tubercle from the triangular ligament, under the connexions of the acceleratores urinæ and sphincter ani.

TRANSVERSALIS PERINEI ALTER is one of a pair of muscles sometimes present in the perineum. It is smaller than the last, and arises further backwards from the tuberosity; consequently these parts having the same insertion with the former, are situated more in an acute angle with each other than the last mentioned.

THE ACTION OF THE FOREGOING MUSCLES. The use of the Erector Penis is to shorten and compress the crus, by which its cells are made to contain less blood, and from which more is sent to the body of the penis. It therefore only assists in the erection of the penis; other muscular contractions being required to retain the blood within the organ.

The acceleratores urinæ, sphincter ani, and transversales perinei, act with each other to accomplish the ends of each. That the first of them shall have complete effect upon the bulb of the urethra, it is necessary that the triangular ligament should be made tense, in order that the bulb might be supported against it by the contraction of the muscle. This is done especially by the sphincter ani, assisted by the transversales perinei muscles. It is also expedient for the effectual contraction of the acceleratores urinæ, that they should be antagonized with, by the transversalis perinei. These last therefore are active in drawing the centre of union of the muscles of the perineum upwards and backwards; by which this point and the tendinous line at the lower part of the bulb are fixed, giving full opportunity to the action of these muscles. The acceleratores then are very efficient in aiding the erection of the penis, by compressing the bulb, and preventing the return of blood through the course of the corpus spongiosum urethræ.

To the transversalis perinei therefore may be attributed the use of assisting the acceleratores urinæ in their action: and to the sphincter ani belongs the property of making tense the triangular ligament, and thereby also assisting the action of the accelerator. It also sustains the perineum, and the parts within the pelvis, by bringing forward the coccyx. It assists moreover, in the expulsion of the fœces while that office is performing, and closes the end of the rectum, while it is not necessary to have recourse to that evacuation.

Bulb of the Urethra. Now detaching the accelerator from one side, and turning it over, we will have brought to view the bulb of the urethra. We find that muscle to have been easily detached from the side of the bulb, having been loosely connected with it; but at the ligamentous line of union there is a firm adhesion to the bulb throughout its whole course. This also we will perceive to have given the acceleratores an opportunity of more complete action in compressing the bulb.

At this stage of the dissection we are made acquainted, that, the corpus spongiosum urethræ forming the bulb, terminates abruptly upon the anterior surface of the triangular ligament; and receives from it a membraneous sheath which binds it close to the ligament; and then proceeds forwards upon the urethra under the acceleratores.

The corpus spongiosum at the bulb is of the same structure as that around the canal of the urethra elsewhere;* but the congeries of veins at this part is greater:—hence the size of the bulb compared with that of the rest of the urethra. From this part also considerable hemorrhage is to be expected, if it should be chosen as the place for finding the groove of the staff in the operation of lithotomy.

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* As it is not essential to the elucidation of the surgical anatomy for lithotomy, that I should enter into a minute detail of the genital organs, I shall reserve a particular description of these parts until, pursuant to my plan, I come to treat on the morbid structure and pathology connected with some surgical diseases to which these parts are liable.

It will be right now to examine the relative situation of the crura penis with the bulb; and the extent of a space found on the forepart of the triangular ligament, on each side the bulb, between it and the crura; which is evident after the cellular connexions of the muscles have been cleared away.

CRURA PENIS. Having removed the erectores from each side, these bodies are seen to have commencement from the bone where the rami of the ischia and pubes join. They then take a course upwards, being attached and following the rami of the pubes as far as the symphysis, opposite which they unite to form the body of the penis. They are of the cellular structure, denominated corpus cavernosum, and contain principally red blood from reflected branches of the internal pudendal arteries.

TRIANGULAR LIGAMENT OF THE URETHRA. Clearing the perineum by removing the penis, we have a view of the triangular ligament. This we find does not go up to the very arch of the pubis; that part being occupied by what has been called the pubic ligament: but it is stretched across the arch from the rami of the pubes, as described whilst upon the ligamentous connexions of the bones of the pelvis. The hole through this ligament for the passage of the urethra from the bulb, is placed at about its centre, and from the thickness of the ligament at this part, the urethra is sustained by it for upwards of a quarter of an inch. This also, is that part of the urethra which receives the ducts from Cowper's glands; they pass into its sides obliquely, from above and outward; for these glands are situated within the substance of the triangular ligament.

There will still have remained a quantity of fat between the side of the rectum and the inner surface of the tuberosities of the ischium filling two great pits, that will be seen when it is cleared away. The handle of the knife is almost sufficient to remove it, or by a little dissection it will come away wholly, for its connexions are not very firm.

These pits being cleared, the levatores ani will be seen covering the sides of the rectum; the extremities of their fibres having intermixture with those of the sphincter: so that these muscles will be found to be inserted into the sphincter as well as into the extremity of the gut. It will be remarked also, that a great mass of the fibres of these muscles pass down immediately behind the triangular ligament, and consequently by the side of the membraneous urethra, to have connexion with the muscles of the perineum at the common centre of union: but this however will be more particularly described when we obtain a side view of the pelvis.

If this opportunity is taken to inspect the ileo-vesical fascia, the light will be observed to shine through it, by taking the observation from the pit before us; and at this time also, its extent from the side of the pelvis to the bladder may be ascertained. If water is poured in from above, not one drop will be found to issue through the outlet of the pelvis; showing that a complete septum is formed between the pelvis and perineum by this substance.

We are not to let this opportunity escape us, for viewing the relative situation of the internal pudendal artery; although I yet intend to give a particular description of it and its distributions.—We find this vessel, as connected with the operation, to pass to the inner side of the tuberosity of the ischium, and within the process sent forward by the anterior sacro-sciatic ligament, which has been described as continuous with the triangular ligament of the urethra. In this way it is continued up behind the triangular ligament, until it passes through an opening under the arch of the pubis, to be distributed to the body of the penis.

From the branch of the triangular ligament and the process from the anterior sacro-sciatic, a covering is sent up, which is the aponeurosis to the obturator internus muscle; this cannot be traced further than near where the iliac fascia takes its leave from the walls of the pelvis, to become attached to the side of the urinary bladder.

Levator Ani. We are now to prepare for a view of this muscle to its full extent; this is best acquired by sawing through the ramus pubis just below the symphysis, and through also the ischium, anteriorly to its spinous process. Both these incisions will be carried into the thyroid foramen; after which the obturator internus muscle, with the bone, are to be removed, when we will have before us the levator ani.

Upon cleaning this muscle, we see its fibres disposed of in a radiated form, converging towards the anus. It *arises* fleshy from the spinous process of the ischium; then leaving the bone, it continues its origin tendinous from the ileo-vesical reflection, through the whole course of its curvature towards the pubis; and then fleshy again from the side of the symphysis pubis over the membraneous part of the urethra. Its tendinous origin from the fascia, increases the density of this substance, from which circumstance the ileo-vesical fascia would appear of different structure from the fascia iliaca. The fibres of the levator ani, which proceed from the symphysis, are collected into a thick fleshy bundle, and pass down immediately behind the triangular ligament, by the side of the membraneous part of the urethra, to be *inserted* into the back part of the ligamentous centre which gives attachment to the muscles of the perineum. The next portion of the muscle being much more thin and expanded, is inserted into the extremity of the gut, being interwoven with the fibres of the sphincter; while the fibres proceeding from the spinous process of the ischium, are inserted in common with the posterior part of the sphincter, into the extremity of the os coccygis.

These two muscles are nearly of funnel-like shape, being connected together anteriorly, but allowing a passage for the membraneous part of the urethra; and posteriorly, they are distant from each other, equal to the space between the two spinous processes of the ischia. In addition to this, we have muscular fibres proceeding from the spinous process of the ischium and anterior edge of the posterior sacro-sciatic ligament; to be inserted into the side of the bones of the coccyx, and are described as the coccygeus muscle; but from its continuity with the former muscle, it would be better understood perhaps, were it termed *the coccygeal portion of the levator ani.*

The use of the levator ani is to raise the extremity of the rectum, to contract in some degree its inferior part; and by acting in alternation with the sphincter ani to effect the expulsion of the fæces. In addition to this, when the anterior parts of these muscles are in action, the membraneous urethra is compressed: hence, they assist the acceleratores urinæ in the expulsion of urine and semen, and have to do with spasmodic stricture and those obliterations of the urethra taking place at the membraneous part.

A paper is contained in the first volume of the Medico-Chirurgical Transactions, by James Wilson, Esq., being a description of two muscles surrounding the membraneous part of the urethra; and which are stated to have been not generally known. I have frequently searched for the muscles he has mentioned, and have never been able to find any, distinct from the anterior edges of the levatores ani. These portions I think will answer to his description of the separate two; and be equal to the action he has ascribed to them, upon the membraneous urethra; except of being able "to draw the membraneous part of the urethra upwards, so as to compress it against the inside of the cartilaginous edge of the pubis." Mr. Wilson also says, "When bougies have been introduced into very irritable urethræ, and have been permitted to remain in them a few minutes, I have often observed on their being withdrawn, that they were much flattened at the part which lay on the membraneous portion of the urethra. This could only be occasioned by the muscles which in the perineum are connected with the middle tendon of the muscles now described, contracting at the same time, rendering the perineum a fixed point, and thereby obliging the fibres of the muscles surrounding the urethra, to form in their contraction a straight line, and thus to compress the sides of the urethra more than the under part, and by this means to change the urethra from a circular to an elliptical form."

The fact I believe to be, that the two muscles spoken of by Mr. Wilson are identified with the anterior portions of the levatores ani; and these portions are massy, to fit and effectually contract the membraneous part of the urethra; and large, that an equal antagonizing power might exist against the sphincter in its effect upon the triangular ligament.

SECTION THIRD.

THE PARTS CONNECTED WITH LITHOTOMY FROM A LATERAL VIEW OF THE PELVIS.

We are now to remove the levator ani from its points of insertion, and prepare to take away the remainder of the os innominatum. In doing this we will leave the spinous process of the ischium, attached to the posterior sacro-sciatic ligament; that its relative situation may be seen after the ileo-vesical fascia shall have been detached in lifting the bone: moreover, it will be right to preserve a little of this fascia, that no doubt may exist as to the particular part of the bladder with which it is connected; so that we may be able with the forceps as represented in plate ninth, to ascertain exactly how far into the neck and bas fond of this viscus, an incision may be extended for the extraction of a calculus, in the operation by the knife, without entering the cavity of the pelvis as bounded inferiorly by the ileo-vesical fascia.

Among the first things we observe is the edge of the triangular ligament of the urethra; where it has been detached from the ramus of the pubis and ischium, and will be seen at its upper part to be full half an inch thick; here are situated, the glandulæ antiprostatæ or Cowper's glands. At about half way down, an opening will be remarked, which gave passage to the internal pudendal artery from its posterior surface; and at its lower part, we find it thin where it was continuous with the process sent up from the anterior sacro-sciatic ligament.

The ligament, besides the process sent from its forepart covering the bulb, also gives off membraneous portions from its posterior surface; these are of some consequence, and shall be described when we speak of the parts to which they are affixed.

The Membraneous Urethra is that portion of the canal that is devoid of an envelopement from the corpus spongiosum; and is situated between the posterior surface of the triangular ligament, and the anterior pointed extremity of the prostate gland; it is from three-quarters to an inch in length, and has opening into it certain of the small lacunæ.

This part of the tube, were it not for getting supply from the triangular ligament, would be made up simply of a continuation of the membrane lining the canal at other parts; which would render it liable to be broken through, in the introduction of the catheter, especially if there was any obstruction from stricture or otherwise; it is therefore contained within a sheath sent backwards from the triangular ligament, and from around the hole through its substance, which gave passage to this part from the bulb. By this it is supported and made to retain its relative situation, and particular distance from the prostate gland; and it is from this also, that it is *not always* torn through from the resistance which the gorget meets, in passing the substance of the prostate; as we are not without instances, wherein this has been the consequence of the use of that ill appropriated instrument.

PROSTATE GLAND. This is a substance firm and hard in its texture, and of the size of a walnut in its natural state. It is situated around the neck of the bladder, having the prostatic urethra passing principally its upper part. It has been described to consist of three lobes, which under disease, are sufficiently evident; but in nealthy circumstances not so apparent. The figure of the gland is like that of a spanish chesnut, being bulged a little on each side; hence, two of its lobes. The third lobe of the prostate can hardly be traced but under disease; it is then found to be an enlargement situated at its posterior part between the two lateral lobes, and projecting upwards and forwards within the cavity of the bladder at its neck. This produces a great alteration in the course of the urethra, behind the arch of the pubis, is the cause of troublesome retention of urine, and can scarcely be felt by the finger in the rectum.*

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* See Sir Everard Home's paper, in the Philosophical Transactions for 1806, also his work upon strictures in the urethra, and on the diseases of the prostate gland.

The prostate gland has a fleshy appearance, is of spongy substance, but rendered one of the firmest glands in the body by the very dense covering it receives from the back part of the triangular ligament of the urethra; which is supplied to it in continuation from that portion around the membraneous part. This coat is analogous to the tunica albuginea of the testis, and is perhaps preventing an enlargement of the gland in the incipient states of disease by the lateral lobes; and may be the reason why it is ready under inflammation to increase in size at its back part, and toward the cavity of the bladder; from that being covered only the membrane lining the viscus.

This gland sends ten or twelve ducts, that open obliquely by the side of the ridge at the lower part of the prostatic urethra called *caput gallinaginis.* And amid the cluster of their opening, on each side this ridge, is the termination of the seminal duct.

Vesiculæ Seminales. These are two small pyriform bodies, situated between the bladder and rectum, immediately behind the prostate gland. They are separated from each other behind, but anteriorly they converge and are approximated. They are about three fingers breadth in length, and have between them a triangular space at the base of the bladder which is not covered by peritoneum, and this is the situation at which the trocar is to be presented, when the bladder is punctured by the rectum.

Each vesicula is shut at its posterior extremity, and is composed of a convoluted tube, that has a common entrance with the vas deferens through the substance of the prostate gland; by a small canal about a finger's breadth in length that terminates by the side of the verumontanum.

The vesiculæ seminales are sometimes simple bags, like the gall bladder; preserving however their external form, yet not having the convoluted canal with which they are usually made up. In structure they consist of a lining membrane throughout their cavity, which is a secreting surface, and assigned according to the opinion of Mr. Hunter, to give out a mucous fluid, for the purpose of serving as a vehicle for the semen: over this, they are covered by a tunic of the structure somewhat of ligament, which is in continuation with that around the prostate gland and membraneous urethra, and derived from the triangular ligament. It enters into the convolutions of the vesicle, and closely surrounds its internal coat. And over all, there is a thin general covering given from the inferior lamina of the ileo-vesical fascia, by which the vesiculæ are attached to the base of the bladder, and by which their convolutions are connected to each other. There are a few things to be attended to, in reference to the relative situation of the vesiculæ seminales. First, that their extremities are opposite the spinous processes of the ischia; then that it is at these parts that the ileo-vesical fascia ends its attachment to the side of the bladder; that opposite these parts also, the peritoneum becomes reflected to line the sacrum and cover the rectum; and that at their extremities is situated the bottom of those pits at the back part of the bladder, which are bounded by its bas fond, the pelvic partition and the peritoneum; and into which, urine is likely to find a way, when the ileo-vesical fascia shall have been wounded; by improperly directing the incision in lithotomy: and lastly, the distance between these bodies throughout their course, and the line of attachment of the pelvic partition, to the side of the bladder; by which may be seen the extent, and the direction that is afforded for the incision in the operation for the stone.

The inferior lamina of the ileo-vesical fascia is the covering that passes under the base of the bladder, the prostate gland, and vesiculæ seminales; being sent off by the pelvic partition at its junction with the side of the vesica urinaria. It lies over the muscular coat at the bas fond, and supports the bladder in like manner as the superior lamina sustains it up to the peritoneal investment.

The vas deferens will be seen passing up immediately by the inside the vesicula seminalis, and taking a course along the side and back part of the bladder at the line of reflection of the peritoneum: and the

Ureter will be observed to perforate the side of the bladder midway in the course of that line where the pelvic partition has its connexion.

THE INTERNAL PUDENDAL ARTERY is among the anterior branches of the internal iliac. It arises from the anterior part of the trunk, after the uterine in the female, and the hemorrhoidalis media have been given off; and takes a course towards the spinous process of the ischium, to pass out at the under part of the ischiatic notch. Going behind, or to the outside of the posterior sacro-sciatic ligament, it enters the pelvis again between the two ligaments; then running up the inside of the tuberosity of the ischium, is concealed for some way by that extension of the anterior sacro-sciatic ligament which goes to join the triangular ligament of the urethra; after passing behind this, and the triangular ligament, it takes a course under the arch of the pubis, to go into the substance of the penis.

In this course it divides into several branches, which are distributed; first to the anus, called hemorrhoidalis externa; then to the prostate gland and membraneous urethra. As it ascends the arch, the perineal artery is given off, with the artery of the bulb, and one to the septum scroti. It afterwards, proceeding under the arch of the pubis, divides into two branches; one going to the penis, is distributed to the cells of the corpus cavernosum; and the other on the dorsum, runs as far as the glans, and anastomoses with the artery of the corpus spongiosum, which is in continuation with the artery of the bulb.*

VENA IPSIUS PENIS. The veins of the penis produce a large vein which runs along the penis, and is called vena ipsius penis: it passes backwards between the junction of the crura and under the arch of the pubis, forming a plexus of veins that surround the neck of the bladder and prostate gland.

PUDENDAL VEIN. The branches of the internal pudendal artery are accompanied with veins, which form a trunk which lies in contact with the artery. And the pudic vein communicates anteriorly with the vena ipsius penis at the root of that organ.

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* The pudendal artery is sometimes attached to the lateral and anterior part of the bladder of the urine; and instead of passing outward, between the sacro-sciatic ligaments according to Mr. A. Burns, "traverses the upper segment of the prostate gland" he has added "in all instances of this lusus, which have come to my knowledge, the artery has been above that portion of the prostate gland which projects beyond the side of the urethra."

Monro's Outlines of Anatomy.

Pudic nerves. Are branches from the sacral nerves, and follow the same course as the pudendal arteries. The principal nerve of the penis, is called the dorsal nerve. It is placed between the corresponding artery and vein, and running along the dorsum penis, terminates in the glans.

CHAPTER II.

THE OPERATION OF LITHOTOMY.

I SHALL now without further preface, proceed to give directions for lithotomy. This I shall so arrange as to keep pace with the anatomical structure; my principal aim being to ally closely, anatomy with surgery. I shall forego a detail of the symptoms indicating the presence of urinary calculi, and with them a description of those constitutional conditions, which forbid the operation; I shall therefore commence under the impression that we have before us a male adult subject, with a stone in his bladder of considerable size; and under circumstances, every way favourable for the performance of the operation.

The instruments necessary are not many. A staff grooved, not on its side as lately recommended, nor upon its under or convex part; but midway between those two situations, I would choose for this operation. The size of this staff should be as large as could be introduced into the bladder without pain; that its groove might be wide, by which the urethra would be stretched, and more easily cut into, at the part which shall be chosen for the introduction of the beak of the instrument that is to divide the prostate and neck of the bladder. A scalpel double edged, to execute the first and second incisions; then a beaked knife, which should be of the shape and length in the blade, of the common probe pointed bistoury, but of greater strength, proportioned to the nature of the parts to be divided. Moreover straight and curved forceps, for the extraction of the stone, and also a small clyster syringe with an ivory pipe. These, with some dry lint, a little oil, and sponges, are nearly all, with which the surgeon will be required to equip himself; yet it is nevertheless necessary, that every instrument should be at hand, which any accident might call forth; as the means for securing the internal pudendal artery, &c.

When the patient can bear it, sixteen ounces of blood might be taken from the arm, about two days previous to the operation; and a brisk cathartic should be administered the day before, by which less inflammation after the operation will be likely to supervene. The rectum also should be evacuated by a clyster, immediately before the operation, that the gut by being empty, may be out of the way of being wounded in the division of the prostate gland. To enable the surgeon to divide the neck of the bladder in the proper direction, it is right that it be somewhat distended; and to effect this, the patient should be required to retain his urine for a few hours previous to the operation.

The preceding circumstances having been attended to; the patient is to be placed upon a table of ordinary height, on which blankets are laid; and having his shoulders a little elevated by a couple of pillows, he is to be bound hands and feet, after the manner peculiar to this operation. An assistant is to be placed on each side, whose duty it shall be to keep the knees separated, that the parts about the perineum may be put upon the stretch. The one at the left side of the patient also bearing in mind that he is to support the scrotum and hold the staff.

Previously to the cutting being commenced in, and while the staff is in the bladder, the surgeon will satisfy himself that he can feel the stone, and also request a second person to feel it by that instrument, lest, as has occurred, it might slip into a sac before formed in the bladder, and he be disappointed, and unable to extract it after the other parts of the operation had been performed.

The surgeon is now to prepare to make what has been called the first incision. The scrotum therefore being held up by the left hand of the assistant, at the right side of the patient, when the perineum will be completely made tense; he will begin to cut at the left side of the perineum opposite the arch of the pubis, this will be also immediately over the junction of the crura penis; and over that part where the bulb is situated more closely to the crus, and consequently against the upper portion of that triangular space, seen on the face of the triangular ligament on each side, after the accelerator and erector penis have been a little detached from one another. From this spot then, the incision is to be continued through the common integuments, obliquely downwards and outwards, terminating on the inside of the tuberosity of the ischium, in a direction midway between that part and the anus. This will be the full extent to which an incision ought or can be brought under any circumstance. I speak in reference to the probable size of the calculus. To this extent it ought always to be carried; because the parts cut, are unimportant; and because also, the cure after the operation will be facilitated by having a free opening externally; by this a convenient outlet will be given to clotted blood, and to the urine which may have found its way under the skin of the perineum, pursuant to the incision into the urinary bladder. The first incision however, is not to be comprehended in one cut; the surgeon is with his scalpel to go over it again and again; that by a careful division of the cellular membrane and fascia of the perineum, he shall have brought to his view, the muscular fibres of the acceleratores and erector penis. After he has got down on a level with these parts, he will have found that the first incision has not been a very simple one; but one that required to have the track several times passed by the knife. By this time he will have seen the comparative depth of the cellular membrane between that over the bulb, and that about the anus, and on the edge of the gluteus muscle. He will have found also, that not much blood has been lost in this incision; and that he is able to discriminate the situation of the bulb; the place of the transversalis perinei muscle; and that he may now prepare to divide the next order of parts.

The operation is now to be advanced in, to accomplish the second incision. The muscles being in some degree exposed, the surgeon will begin to cut between the accelerator and erector penis; and passing his knife downwards will divide the transversalis perinei. Some blood will now flow from the division of the perineal artery; and perhaps some also from the artery of the bulb: but it is seldom in quantity to require a ligature. A free hemorrhage from these vessels, if it should take place, can hardly be considered an unfavourable circumstance; for it is generally observed, that in proportion to the bleeding during a surgical operation, so, an excess of inflammation is rare, during the progress of cure. At the upper part of this second incision, is the triangular ligament; this should be divided previously to entering the urethra for the groove of the staff. If this is not done, but the groove of the staff laid bare by cutting into the bulb, there will be an unnecessary wounding of a very vascular part, which will be attended with its own consequences. There will be also a difficulty in the introduction of the forceps, and in the extraction of the stone; from the resistance which will be afforded during the rest of the operation, from what may remain uncut of the triangular ligament. This ligament then being divided, the surgeon will have an opportunity of feeling with his finger the groove of the staff in the membraneous portion of the urethra, and of ascertaining the state and situation of the prostate gland; he will also have his attention called to the anterior thick edge of the levator ani muscle; and by recollecting what has been said of the anatomy by a lateral view of the pelvis, he will at once perceive how he is to complete this lateral operation of lithotomy.

The assistant will now be directed to press downwards the staff, that the urethra may be made tense; then with the scalpel previously made use of, or a smaller one, the groove of the instrument is to be cut upon, and an opening made of about half an inch long, that the beak of the knife may find an easy entrance. It will now be the surgeon's care to introduce the beak of the knife fairly into the groove of the staff; and having done so, he will carry it on into the bladder to the extent that it may be his intention to divide it toward the *bas fond.*

Having proceeded thus far, it will be required that he now consider the connexions of the ileo-vesical fascia. The bladder will still have retained its fluid contents; for the division through the membraneous part, will not have allowed of a great discharge of urine; the portion of the levator ani, uncut before the prostate, will by its contraction with its fellow keep it back, so that the relative situation of parts will be nearly as that represented by plate ninth. He will also remember the situation of the vesicula seminalis, and the circumstance of the base of the prostate being perforated by the extremity of the vas deferens. Keeping in mind also the course, and relative distance of the internal pudendal artery, he will be directed what line to pursue to avoid these important parts: for I believe these to be, the great objects of solicitude in this operation: and that, from using instruments at random among these structures, all the hitherto fatal consequences are to be attributed in cases which were favourable to success, before the operation had been begun.

The knife therefore being in the bladder, the surgeon will take the staff from the hand of the assistant, and incline its handle over the left groin of the patient, by which the membraneous urethra and prostate gland, will be removed a little towards the right side of the pelvis, (for this, can be accomplished from the division that has been made in the triangular ligament;) by which he will be able to make his lateral incision, with less risk to the internal pudendal artery. Having proceeded thus far, he is now to direct the end of his knife towards the middle of the sacrum; that is, in a direction opposite its central spinous process; for a line from the membraneous urethra to that point, will be the course that the incision is to take through the prostate gland, and side of the bladder, in order to avoid wounding the pelvic partition, and also the vesicula seminalis. Now having in this way directed the knife, the parts are to be divided as it is withdrawn. This incision therefore is not to be made in the course of the two former, but more horizontally, lest that part of the prostate should be cut which contains the extremity of the vas deferens. It is neither to be carried exactly horizontal, for the arch of the pubis would interfere with a free division of the prostate: but the gland is to be divided obliquely downwards and outwards, which course will occupy a line midway between the termination of the vas deferens, and the situation of the internal pudendal artery.

A gush of urine will follow the division of the prostate, and there will be some hemorrhage attending the operation. Perhaps however, if the internal pudendal artery is not wounded, none of the vessels will require a ligature; but even if this vessel should have been accidentally cut; then completely dividing it, with a little pressure against the ramus of the ischium, may be all that is required to stop the bleeding. If however, this is insufficient, a needle and ligature can be made use of to arrest it.

The surgeon will now introduce the forefinger of his left hand, and feel for the stone; by which he will know that he has it within the bladder. In this course he will introduce the forceps of a size sufficient to embrace the stone, or a scoop may answer if the stone is small; by either of these it can be extracted.

Under circumstances when the stone has been broken, and small particles are supposed to remain in the bladder, it is recommended to clear out the bladder by injecting some mild fluid, as warm water, by the wound. In every instance this may be considered a good practice, as it will serve to dilute the urine that has escaped among the surrounding parts, and to wash away coagulated blood, which by remaining, would be a source of after irritation.

A pledget of oiled lint will now be introduced, and the patient's thighs brought together by a handkerchief; when he will be put to bed: and upon the administration of an opiate, the operation may be considered as completed.

FURTHER REMARKS UPON THE OPERATION OF LITHOTOMY.

To the question, What are the objections to the use of the gorget? I would answer,

I. That among the most formidable, is the possibility, that the beak of the instrument may slip out of the groove of the staff, without the knowledge of the surgeon, although he may have fairly applied it. This has happened with men of eminence, and the instrument has been continued between the bladder and rectum, after which the stone has been grasped by the forceps with the coats of the bladder intervening. That the death of the patient has followed this we can readily take for granted.

II. That, if the gorget shall have an edge so oblique that little resistance might be given by the parts to be divided; then the prostate is not likely to be cut for its whole extent; from which the gland will have to be torn, if not to enable the surgeon to introduce the forceps, at least that he may extract the stone. For, as it is more likely to be lacerated upwards, from the nature of its structure; than backwards or downwards; we can conceive of an opportunity given for urinal infiltration above the ileo-vesical fascia, at the back part of the bladder.

III. That, when the cutting edge of the gorget is more at a right angle with the rest of the instrument; that a greater extent of incision may be accomplished through the prostate: then more force is required to divide the parts; by this the membraneous urethra is likely to be torn through from the resistance to the cutting edge, made by the prostate. So that in such case the patient would have to be abandoned. I am very confident all this has happened in some instances, to which I could refer.

IV. Although, not so much the fault of the instrument as of the operator; I have remarked in many instances in which I have seen the gorget used; that, after the beak had been carefully introduced within the groove of the staff; the surgeon, as if the most dangerous part of the operation was over, would prepare to make a free thrust, consoling himself that the instrument would divide no more of the side of the bladder than its breadth would indicate; and being cautious only to keep out of the way of wounding the rectum and vesicula seminalis, would so depress the handle of the gorget and pull down the staff also, that the incision would be carried almost directly upwards, behind the symphysis pubis. When I first saw this, I was led ever afterwards to remark it; and as soon as I became conscious of the attachment of the iliac fascia, I was immediately struck with this explaining many of the fatal occurrences, as after the operation of lithotomy by the gorget.

Upon the four points however, in which I have objected to the gorget; the Knife would appear not in any way chargeable.

I. The beak of the knife cannot slip from the groove of the staff, without the knowledge of the surgeon. He is not prepared to cut, until he feels the staff for some extent with the back of his knife, as well as the stone itself with its beak. For it is his duty to satisfy himself that it is well adjusted, and fairly within the bladder.

II. The shape of the instrument does not regulate the extent of the incision: for after the knife is within the bladder, the surgeon can cut at will; and from the knowledge he may have by that time gained of the size of the stone; it is his own fault, if he allows any of this viscus to be torn in its extraction.

III. Since the knife is to cut as it comes out, and whilst the surgeon is in the act of drawing it towards himself; the membraneous urethra is rather relaxed than put upon the stretch; and if the bladder or prostate are moved at all by making this incision, the parts are brought nearer the external surface; which at all events will not interfere with the rest of the operation.

IV. I do not think but that seldom, even by accident, the pelvic partition has been divided by the knife in this operation. Surgeons who use the knife, are not in the habit of tilting up the point of this instrument, but have their attention occupied with the manner in which they are to divide the prostate gland, and keep out of the way of the internal pudendal artery; from which they are naturally led to cut into the side of the bladder, in a direction below the attachment of the pelvic partition; and to this circumstance I am satisfied, is principally to be attributed the great success that has attended the knife.

I think it possible, by examining into the different operations for stone which have been practised from the time of Celsus, to the present day; to account for the comparative success of the various methods upon the principle of the pelvic partition remaining uncut. I shall therefore for amusement as well as the instruction of myself and reader, run over this subject with him.

In the earlier ages of surgery, and before anatomy had its present high standing, a few principles guided practice. In regard to this operation, it appeared only necessary to be known that there was a stone in the bladder, and which was ascertained by the finger in the rectum, for it to be got rid of: and we accordingly had the operation, since denominated Lithotomia Celsiana, or the operation by the Gripe, for the purpose of freeing the patient from this troublesome companion.

The manner of performing it was this; the rectum being emptied by a clyster, the patient was directed immediately before the operation, to walk about his chamber, that the stone might be brought down towards the neck of the bladder, and he was afterwards placed in the lap of an assistant, or secured as now, for the lateral operation. The surgeon introduced the two first fingers of his left hand well oiled into the anus; and with the palm of the other hand, pressed above the pubis, that he might have the stone secured against the perineum, he then made it protrude towards the left side in the form of a tumour. With a scalpel now, the tumour was cut upon by a lunated incision through the skin and cellular membrane, directly on the stone and near the anus, down to the neck of the bladder, with horns pointing towards the hips. He then made a second incision transversely towards the neck of the bladder, and the stone being strongly pressed upon by the fingers, started out suddenly, or was extracted by a hook prepared for the purpose.

LITHOTOMIA CELSIANA, OR THE OPERATION BY THE GRIPE.

This has been called surgery in its rude state. It is the operation by the Apparatus Minor; and we have good reason to conclude, that if it had been continued to be performed until the present period, the pages of surgical history would have exhibited less of a bloody stain than they now show forth.

By this operation it was entirely impossible to have wounded the pelvic partition derived from the iliac fascia. The bladder behind the prostate was placed against the perineum, and so brought down, that the ileo-vesical fascia, from its pelvic connexions, would have been out of the way of being cut, there being nothing to fear, but a wound of the vesicula seminalis or vas deferens; for one of the rectum would be of little consequence. I take it for granted therefore, that patients rarely died of peritoneal inflammation after this operation. The dread of incurable fistulas, with the attending inflammation and sloughing, both of the scrotum and perineum; being that which seemed most to interfere with the prognosis. John Bell, of no small authority on surgical matters, speaks of this operation as one that "has been the favourite of men the most eminent in our profession; whose opinions claim respect, and who were not wanting in learning and skill,"—"if it has fallen into disuse merely through lapse of time, and the death of those who used to perform it, and from the disrepute into which itinerant operators are now fallen, with whom it was the favourable operation:—what I have to say in its favour, must be deserving the attention of professional men. Those who have seen the gorget thrust with unrelenting and horrible violence into the narrow pelvis of a child, will read the history of the apparatus minor with no ordinary degree of pleasure."

This operation was by Celsus advised to be performed only on boys from nine to fourteen years of age; this is an acknowledgment that it was successful in patients of that time of life. John Bell speaks of this as being its chief excellence; for in boys the parts are proportionably small: and even if the operation in them was successful by accident, more extensive incisions into the perineum of the adult might be made, where the chances would be much less of wounding important parts, and the probability of success infinitely greater.

THE MARIAN METHOD, OR BY THE APPARATUS MAJOR.

Lithotomy by the Apparatus Major or Marian's method, began to be introduced, about 1524, after the operation by the Gripe had been practised for upwards of two thousand years. John Bell ascribing its introduction to motives of avarice, conceit, and folly, in those who despised the operation of Celsus on account of its plainness and simplicity, proceeds to dispense his reproach upon the operation and all who were connected with it.

If this operation had been more successful than the method described by Celsus, it would have met with very different treatment; and if it had been considered, at the period at which it was performed, as an advance toward perfection from the operation by the gripe, the invectives with which its history is now bestrewed would not have appeared. The great pain it gave the patient, whose cries could not be heard without exciting general commiseration, was not enough of itself to render it opprobrious: or if a much longer time to extract the stone by it was necessary, than in the Celsian method, that was not sufficient to entitle it to the epithets, cruel and horrible! It was an operation unattended with success in any degree, to the one it had supplanted; and why this was the case, we have only to look at the manner of its performance.

We read from John Bell that "the operator kneeling on one knee, made an incision with a razor along the perineum, to one side of the rapha; and feeling with his little finger for the curve of the staff, he opened the membraneous part of the urethra; and finding the point of the knife in the groove of the staff, gave it to an assistant to hold while he passed a probe along the knife into the groove of the staff and thus into the cavity of the bladder; and the probe being fairly in the cavity, the staff was withdrawn. The operator next took in his hands two conductors, a sort of strong iron probes, the one (named the female conductor) having in it, a groove like that of our common directory, the other (the male conductor) having a probe point, corresponding with that groove; and the grooved or female conductor being passed along the probe, and lodged in the bladder, the probe was withdrawn, and the male conductor passed in its turn along the groove of the female conductor, till both were lodged in the bladder lying along side one another. Then commenced the operation of dilating: the lithotomist took a conductor in each hand, and by diverging their shafts dilated, or, in plain language, tore open the prostate gland."

The peculiarity of this operation then consisted, in entering the bladder and dividing the prostate, and as far beyond it as was necessary, for the extraction of the stone; altogether by forcibly tearing the part. Now if we call to mind the structure of the prostate, and the situation taken by the urethra, through its substance; we will at once see, in what direction this tearing of parts would take place. Upwards undoubtedly; to the effect of extensively dividing the Pelvic Partition. The levator ani muscle would of itself have directed to such a course, if the resistance afforded by the lateral lobes of the prostate was not sufficient to accomplish it. The vesicula seminalis and vas deferens were of course, out of the way.

From the ill success that attended this operation, several surgeons attempted to improve upon it, and accordingly the Collets; distinguished lithotomists of their day; thinking the tearing of parts was not sufficiently extensive; put to the instruments one called a dilator, this however was soon rejected, as adding to the cruelties of the operation, and from being followed with as little success. Le Dran, Le Cat, Dionis, Mery, Paree, Marechal, Morand and Rau were busy in operating with the apparatus major; and we find after it had been practised for about two hundred years that the French surgeon Morand, discloses the state of its success in the Hospital of la Charite, in patients that had been operated upon his own hands, and this is the authentic record for five years.

Anno 1731.	14	Cut for the stone,	8	died.
1732.	11	————	4	——
1733.	16	————	8	——
1734.	17	————	9	——
1735.	13	————	9	——
By the Apparatus Major	71	operated on.	38	died.

The mystery attending the fate of the patients who were lost by this operation, must have had its influence upon society; when the illiterate and barefooted friar, Frere Jacques, was taken by the hand, to teach the surgeons of his day, a better mode of extracting the calculus: and from Mr. Allan's treatise on lithotomy, we get in concise terms, his manner of performance.

"He cut all who offered without regard to age or constitution, or the circumstances of the disease; never prepared his patients by bleeding or purging; and never attended to their after treatment. His sole aim was to extract the stone; and so great were the numbers that presented themselves, and such the facility and boldness with which he operated, that he has cut nine patients in three-quarters of an hour.

He never tied his patient, but laid him on a table, with a pillow under his head; the thighs elevated; the heels bent backward towards the buttocks and secured in this position by assistants. He used a large round staff without a groove, and after having passed it into the bladder, he laid hold of it with his left hand, and, by depressing the handle, made or attempted to make that part of the bladder which he meant to strike, protrude in the perineum; then taking in his right hand a long bistoury, shaped like a poignard, he struck it into the left hip near the tuber ischii, two fingers breadth from the perineum; and driving it on towards the bladder, he opened it in its body as near the neck as he could; directing his incision upwards from the anus. He never withdrew his knife until he had made an opening proportioned to the size of the stone. He used sometimes a conductor to guide the forceps, but more commonly he conducted them with his finger, which he thrust into the wound after withdrawing the knife. When he had laid hold of the stone he drew it out quickly and readily, without reflecting on the bad consequences which might follow. If there were more stones, he again introduced the forceps and extracted them as he did the first. This being performed he believed his work perfect, and took no charge of his patient."

Notwithstanding the frequent fatalities attending this first operation of Frere Jacques, the jealousies of the regular lithotomists were excited beyond measure;

for even the random thrusts by his poignard, were more successful in extracting, than the dignified operation with the apparatus major.

The superiority of the operation by Frere Jacques being acknowledged, he was induced to go through a complete course of dissections under Du Verney; that he might be able to operate more correctly, from being made acquainted with the structure of the parts through which he was to cut. We accordingly find him after this, to have adopted a grooved staff, to lay aside his dagger pointed knife, to cut with a scalpel upon regular anatomical principles, to enter the bladder by successive incision, and never to forsake the groove of the staff until he had reached the stone. In this way, as mentioned in Mr. Allan's treatise, he cut thirty-eight patients without loosing one. He cut with the knife; and by closely pursuing the groove of the staff as his guide, in the division of the prostate and neck of the bladder, I can conceive that he left entire the Pelvic Partition.

Rau of Amsterdam, a celebrated and successful lithotomist, pursued the operation of Frere Jacques, after having practised one of his own with comparative ill success; which consisted in extracting the stone by opening the bladder beyond the prostate gland. He concealed however, having changed his manner of operating, even from Albinus his favourite pupil; and the surgeons in London and Paris being taken with his great success, were induced to cut as they knew him before to have practised, and killed very many of their patients.

Mr. Chesselden confiding in the veracity of Albinus, who published upon Rau's operation, imitated him, and many of his patients died in *extreme misery*. What was all this owing to, but to the effects of urinal infiltration above the Pelvic Partition? for if the stone was to be extracted by an opening in the bladder, without a division of the prostate gland, it is very clear that this part must have been wounded. It might be said also, that the peritoneum was in danger; true, it might have been, but the incision was differently directed than towards the extremity of the vesicula seminalis. Mr. Allan in his treatise on lithotomy is very explicit, as to this point in reference to Mr. Chesselden's first operation. After detailing the preliminaries of the performance, he proceeds, "He (*Chesselden,*) now passed the fore finger of his left hand into the middle of the wound, with which he pressed the rectum to one side, to avoid wounding it ; and then taking in his right hand a crooked bistoury, he passed it along his finger, and entered the point of it between the bladder and the vesicula seminalis and os ischium of the same side ; then lowering the hand he carried this incision *upwards*, until the point of his knife came out at the upper extremity of his first incision. Having thus made an opening sufficiently large, with the forceps he extracted the stone : he saved the neck of the bladder entire, and imagined by so doing, he should prevent fistula, an accident which had occurred very frequently to Frere Jacques, and to those performing Marianus's operation. This was his first operation, and although he found little difficulty in cutting into the body of the bladder, *yet from this deep incision, the urine had not free passage by the external wound*, but insinuated itself into the cellular substance surrounding the rectum, causing those very accidents, which this manner of cutting was intended to prevent. Four patients out of ten, on whom he performed this operation, died in extreme misery : and Chesselden soon perceived that Albinus, though long the pupil and assistant of Rau, was no better acquainted with his operation than himself."

Mr. Chesselden therefore lost nearly one half his patients operated upon after the plan of what is called, his first operation ; from the effects of *urinal infiltration :* and this was produced by dividing the bladder upwards; although not with the gorget.

Chesselden was quickly obliged to change this manner of operating, and assumed a second method, and then a third, which last he continued to practice until his death. In his second operation, he cut down on the groove of the staff, into the membraneous urethra, as now practised ; but contented himself with a partial division of the prostate gland; the consequence of which was, that it was torn in the extraction of the stone. Now from what has been said concerning lacerating the prostate by Marianus's method, we know in what direction this substance would have been separated by dilatation—upwards therefore. His second operation was unsuccessful, which induced him to change it; but we are left to explain why it was so? we are only told of two instances, of his having cut into the rectum by this method, and I am not aware that this would be necessarily fatal. We can safely infer, that Chesselden's patients who died from being cut after the plan of his second method, are to have their deaths accounted for from the effects of *urinal infiltration*, the consequence of wounding the Pelvic Partition attendant upon the dilatation of the prostate gland.

Chesselden's third operation was accomplished by turning the back of his knife to the rectum, and striking its point into the groove of the staff through the coats of the bladder, immediately behind the prostate gland: then drawing the instrument toward him, by dividing laterally the neck of the bladder, the prostate gland, and membraneous urethra. In this way he could not have wounded the Pelvic Partition, and the result of this manner of operating, we find to be, that out of the first fifty-two patients, he only lost two.

With reference to the method for extracting the stone above the pubis, called the High Operation of Lithotomy, I have to say, that in proportion as urinal infiltration is to be dreaded, that method should be avoided;—since all extravasated urine, and the blood retained within the pelvis, must be opposed to the under surface of the peritoneum by the pelvic partition, so often spoken of. Pierre Franco, who first wrote upon this operation in 1561, after saying he had performed it once in a child with success, discourages its further practice. In 1761 it was revived however, and first performed in England by Dr. Douglass; and notwithstanding it was frequently successful, it fell into disuse, and gave place to the lateral operation; from the frequent abscesses and gangrenes arising from the extravasation of urine among the parts within the pelvis.

Mr. Carpue of London records, that in 1817, he witnessed, while on a visit to Paris, a revival of this operation by Dr. Souberbeille, in one of the public institutions of that city. It however, was different from the plan adopted by Douglass in England; which difference consisted in what I consider a contrivance to avoid urinal infiltration above the pelvic septum; although the stone was extracted above the pubis. The patient being secured in the usual manner for lithotomy, he first introduced a staff, and made an incision into the perineum, and then into the membraneous urethra; he afterwards introduced a director into the groove of the staff which he withdrew; he then passed along the director an instrument that had somewhat the form of a catheter, which was held by an assistant; the director was then removed and the instrument was suffered to remain in the bladder. The patient was next untied, and placed in a different position, to accommodate for the cutting above the pubis, which was conducted by making an incision through the integuments and linea alba of four inches in length from immediately above the pubis; while the instrument previously introduced into the bladder (the *sond-de-dard*) pressed the bladder against the parietes; thus rendering it unnecessary that the viscus should be distended with a fluid to raise it above the pubis. All that can be said in favour of this operation is that it has originality; and it is certainly entitled to the credit of combining both high and lateral operations, which I will give as its panegyric. We are not informed of the result of that case, and must therefore be silent upon its comparative success.

As the proposed size of this volume is now accomplished, I do not think it necessary to detain the reader by extending my inquiries into the most frequent causes of death after lithotomy. I would recommend him however, for his further edification, to consult the various authors who have written on this subject; and especially the late distinguished writer, Mr. John Bell, in his Principles of Surgery; keeping at the same time in mind, what has been said of the pelvic partition, with the manner of its connexions: FOR I AM CONVINCED, THAT TO WHATEVER LENGTH THE SUBJECT IS INVESTIGATED, THIS MAXIM WILL BE MORE AND MORE ESTABLISHED; THAT THE ILEO-VESICAL FASCIA IS TO BE PARTICULARLY AVOIDED BY THE CUTTING INSTRUMENT IN THE OPERATION OF LITHOTOMY.

END OF PART FIRST.

ERRATA.

Page 8,	line 15,	for or, read in.
32,	15,	oponeurosis, read aponeurosis.
48,	14,	prostrate, read prostate.
	18,	do. read do.
	19,	gallihaginis, read gallinaginis.
63,	6,	prescribes, read prescribing.
66,	19,	internal, read intestinal.
71,	1,	obdurator, read obturator.
92,	14,	was, read has.
193,	1,	Marian's, read Marianus's

EXPLANATION TO THE PLATES.

Explanation of Plates.

PLATE I.

This Plate represents a dissection of the groins after the common integuments and superficial fascia have been removed. There happened to be in the subject from which the drawing was taken, an incipient femoral hernia at the left side. This has been delineated, and will serve to show the part at which that form of the disease makes its first appearance.

a, b, The two Pyramidal muscles, seen through the tendon of the external oblique.
c, The Suspensory Ligament of the penis connecting that part to the symphysis pubis.
d, The Spermatic Chord, as it passes the external abdominal ring.
e, p, Poupart's ligaments.
f, A small Femoral Hernia protruding the side of the sheath for the femoral vessels.
g, The Iliac Portion of the fascia lata.
h, The Inguinal Vein seen through the femoral sheath.
i, The Falciform Edge of the fascia lata.
k, The Pubic Portion of the fascia lata.
l, m, u, w, The Saphena Veins.
n, The Superficial Fascia turned up.
o, The Spine of the ilium.
q, The Upper Range of inguinal glands.
r, s, Branches of the external pudendal vessels.
t, The Lower Range of inguinal glands.

PLATE II.

This Plate shows a dissection of the groin of a female subject. The external oblique muscle has been removed above, and the fascia lata turned back below.

A, B, The Ligament of Poupart.
C, The Sheath of the Femoral Vessels.
D, E, The Fascia Transversalis.
F, The Internal Abdominal Ring with the peritoneum undisturbed passing to line the iliacus internus muscle.
G, The Round Ligament of the uterus taking the course of the oblique canal.
H, The Fascia Lata of the thigh pinned back.
I, The External Iliac Artery seen through the internal abdominal ring.
k, The Tendon of the internal oblique covering the rectus muscle.
l, The Lower Edge of the internal oblique muscle turned up, having been detached from Poupart's ligament.
m, The Lower Edge of the transversalis muscle detached and turned up.
n, The Pectinalis Muscle.
o, Some branches of the external pudendal vessels.
p, The Long Head of the triceps adductor femoris.
q, r, The Saphena Veins.
s, The Spine of the ilium.
t, The Tensor Vaginæ Femoris Muscle.
u, The Anterior Crural Nerve.
w, The Sartorius Muscle.

PLATE III.

This Plate is intended to show the Mouth of the Crural Sheath with the parts adjacent, and to be particularly demonstrative of the Crural Arch.

A, The Symphysis Pubis.
B, Thyroid Foramen.
C, The Spinous Process of the ischium.
D, The Bird's Head articulating surface of the ilium.
E, A Portion of the anterior abdominal parietes lined by fascia transversalis.
f, The Internal Abdominal Ring.
g, The Epigastric Vessels previously to perforating the sheath of the rectus.
h, The Crural Arch covered by fascia transversalis in its passage from the parietes to the forepart of the femoral sheath.
i, The Ligament of Poupart.
k, The Trunk of the Obturator Artery proceeding from the epigastric.
l, The Crural Aperture.
m, The Broad Insertion of poupart's ligament.
n, The Anterior Superior Spinous Process of the ilium.
o, The Fibres at the outer extremity of the crural arch seeking insertion through the muscles as they pass out of the pelvis.
p, A Lymphatic Gland situated behind poupart's ligament to the outer side of the iliac artery.
q, The Trunk of the Epigastric Artery.
r, The Trunk of the Epigastric Vein.
s, The External Iliac Artery.
t, The External Iliac Vein.
u, The Internal Iliac Artery.
w, The Internal Iliac Vein.

PLATE IV.

This is from a drawing taken of a Dried Preparation, referred to in page 74. It is intended to give an idea of a peculiar origin to the obturator artery, and also to show some of the arterial distributions within the pelvis.

A,	The Abdominal Aorta, at the origin of the right renal artery.
B,	The Right Primitive Iliac going from the bifurcation of the aorta.
C,	The Left Primitive Iliac.
D,	The External Iliac Artery of the right side.
E,	The Internal Iliac Artery.
F,	The Femoral Artery.
g, h,	Lumbar Arteries.
i,	The Bird's Head articulating surface of the sacrum.
k,	The Inferior Mesenteric Artery.
l,	The Obturator Nerve.
m,	The Spermatic Artery.
n, p,	The Arteria Circumflexa ilii.
o, q,	The Arteria Epigastrica.
r,	The Symphysis Pubis.
s, u,	The Two Sources of the obturator artery.
t,	The Trunk formed by the two obturators, previously to passing through the obturator ligament.
w, x,	The Sciatic Arteries.
y,	The Internal Pudendal Artery.
z,	The Posterior Sacro-Sciatic Ligament.

PLATE V.

This Plate is intended to exhibit the relative situation of the Blood Vessels, at the back part of the pelvis; and it shows also the extent of the incision in the abdominal parietes, required for securing the iliac arteries, according to the method recommended in the body of the work.

A, Vena Cava Abdominalis.
B, The Aorta.
C, The Part at which the ligature was applied around the aorta.
D, The Situation of the ligature around the Common or Primitive iliac.
E, The Ligature around the Internal Iliac.
F, The Ligature around the External Iliac applied through the internal abdominal ring.
g, The Superior Mesenteric Artery.
h, The Termination of the Left Spermatic Vein into the Emulgent.
i, The Termination of the Right Spermatic Vein into the side of the Cava.
k, l, The Origin of the Two Spermatic Arteries.
m, m, The commencement of the Ureters from the pelves of the kidneys.
n, The Inferior Mesenteric Artery.
o, o, The Iliacus Internus Muscle.
p, p, The Psoas Muscle.
q, q, The Anterior Superior Spinous Processes of the Ilium.
r, r, Absorbent Glands.
s, s, The Meeting of the Spermatic Vessels with the Vas Deferens at the internal abdominal ring.
t, t, The Epigastric Vessels.

u, u, The Divided Edges of peritoneum and fascia transversalis to expose the epigastric vessels.

w, The Opening made into the parietes above poupart's ligament through which the ligatures were applied upon the common and internal iliac arteries.

PLATE VI.

This Plate represents the External Iliac Artery of the right side, with two Ligatures around it, that had been applied through the Internal Abdominal Ring.

A, The Common Iliac Artery.
B, The External Iliac Artery.
C, The Internal Iliac Artery.
D, The External Iliac Vein.
E, The Femoral Artery.
f, The Two Silken Ligatures around the Artery, tied about the eighth of an inch apart.
g, The Clot within the Artery, of a dark brown colour.
h, The Upper Portion of the Clot formed of coagulable lymph.
i, The Origin of the circumflexa Ilii.
k, The Origin of the Epigastric Artery.
l, m, The External Pudendal Arteries.
o, A Portion of the internal surface of the Vein, apparent by being turned over.
p, The Part at which the Saphena Vein enters.

PLATE VII.

This Plate exhibits a dissection of the Perineum; and is intended to display of the muscles of that part.

A, The Centre of Union of the muscles of the perineum.
B, The Anus.
C, The Extremity of the Coccyx.
d, The Urethra.
e, g, Those Slips of Muscular Fibre of the Acceleratores Urinæ which pass around the body of the penis.
h, i, The Acceleratores Urinæ situated upon the bulb of the urethra.
f, k, l, The Erectores Penis.
m, The Tendinous Line connecting the acceleratores at the lower part of the bulb.
n, s, Portions of the Triangular Ligament of the Urethra seen at each side.
o, t, The Transversales Perinei Muscles.
p, x, The Sphincter Ani.
q, w, The Tuberosities of the Ischia.
r, y, The Gluteus Maximus Muscle of each side.

PLATE VIII.

This Plate is designed to exhibit a deeper dissection of the Perineum. The muscles from the left side have been removed, to give a view of the Triangular Ligament of the Urethra. The arched appearance of its under edge is also shown by the fibres of the sphincti ani having been put upon the stretch.

A, The one half of the Triangular Ligament of the Urethra of the left side.

B, The Bulb of the Urethra covered by a Membraneous Expansion from the anterior surface of the triangular ligament.

C, The Main Trunk of the Internal Pudendal Artery passing an opening at the upper part of the triangular ligament to be distributed to the corpus cavernosum penis.

D, The Tuberosity of the Ischium.

E, The Internal Pudendal Artery in its passage to the inside of the tuberosity of the ischium.

F, The thick Anterior Part of the Levator Ani Muscle, that passes by the side of the membraneous urethra immediately behind the triangular ligament.

G, The Remainder of the Levator Ani Muscle, which arises from the ileo-vesical fascia.

h, The Crus penis detached and turned up.

i, The Foramen Thyroideum.

k, The Spine of the Ilium.

l, The Cavity of the Acetabulum.

m, The Sphincter Ani around the extremity of the rectum.

n, The Posterior fibres of the Sphincter Ani which have attachment to the end of the Coccyx.

o, The Accelerator Urinæ of the left side dissected off the bulb, and turned over.
p, s, The Upper Parts of the Triceps Adductor.
q, The Transversalis Perinei turned over.
r, The right Transversalis Perinei.
t, The Anus.
u, Part of the Gluteus Maximus.

N. B. It will be observed that the left os innominatum is foreshortened in this engraving.

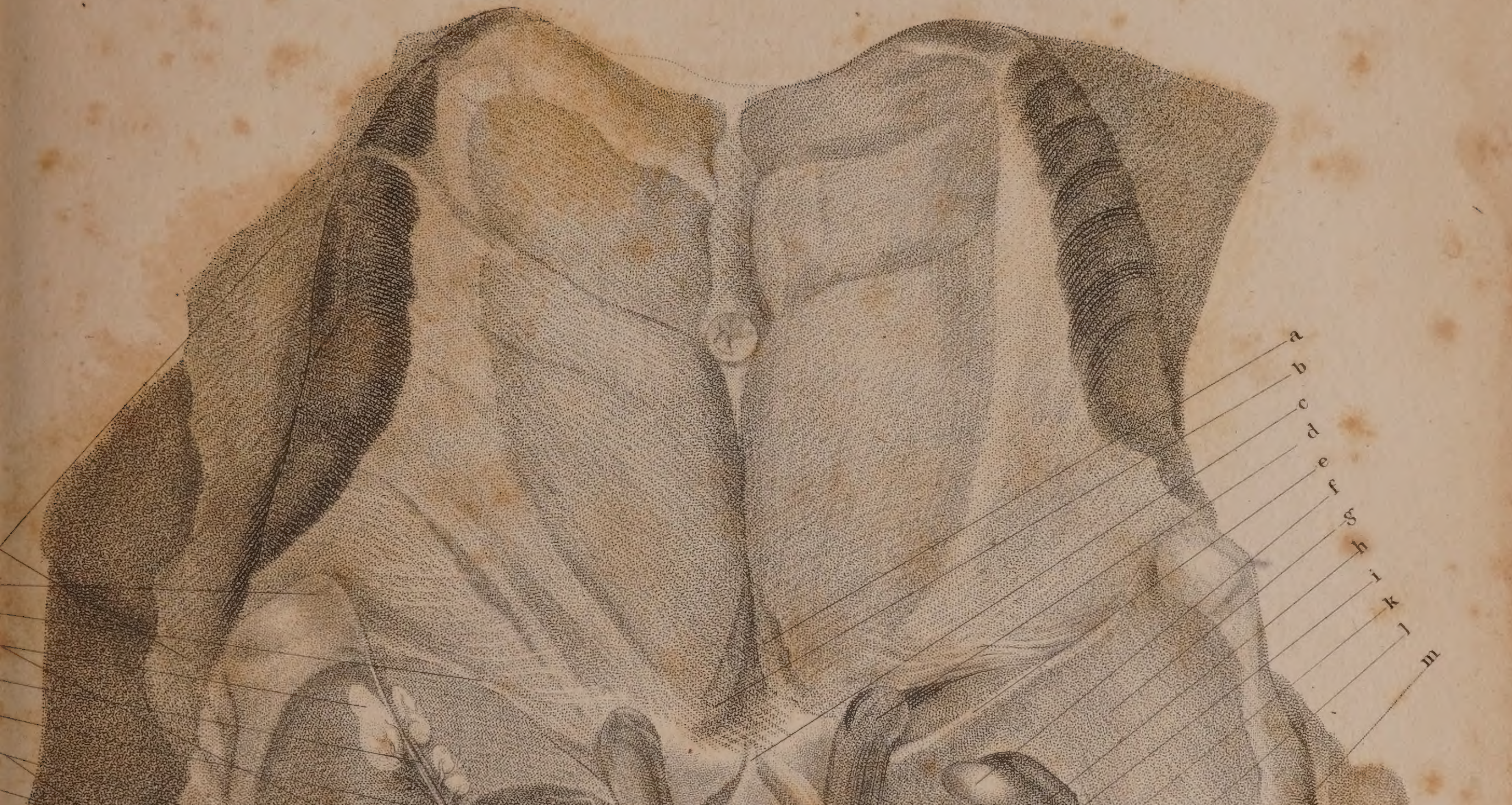
PLATE IX.

This Plate represents a side view of the contents of the male pelvis, and it is designed especially to show the part at which the fascia iliaca hath connexion to the side of the bladder, and thereby the space, afforded for the Lateral Incision in Lithotomy.

A, The Urinary Bladder distended with air.
B, The Side of the Pubis that enters into the articulation of the symphysis.
C, The Articulating Surface at the side of the sacrum.
D, The Spinous Process of the ischium retained in its relative situation by the posterior sacro-sciatic ligament.
E, The Rectum.
F, The Corpora Cavernosa Penis.
G, The Prostate Gland.
H, The Seminal Vesicle of the left side.

a, A Catheter introduced into the Urethra.
b, The left Crus Penis turned up.
c, The situation of Cowper's Glands within the substance of the Triangular Ligament of the Urethra.
d, That part of the Base of the bladder covered by the inferior Lamina of the ileo-vesical fascia.
e, The Membraneous Part of the Urethra.
f, The edge of the Triangular Ligament detached from the rami of pubis and ischium.
g, The Bulb of the Urethra.
h, The Extremity of the Coccyx.
i, The End of the Rectum tied.
k, That part of the bladder covered by the Superior Lamina of the ileo-vesical fascia.
l, The Fundus of the Bladder covered by Peritoneum.
m, The Iliac Fascia attached to the side of the Bladder, and held up by the forceps to show the tendinous origin of the Levator Ani, as well as the space between its connexion and the vesicula seminalis allowed for the incision in Lithotomy.
n, The Vas Deferens.
o, The Ureter.
p, The commencement of the Rectum at the Base of the Sacrum.

PLATE I.



B. A. Vitry del. A. B. Durand sc.

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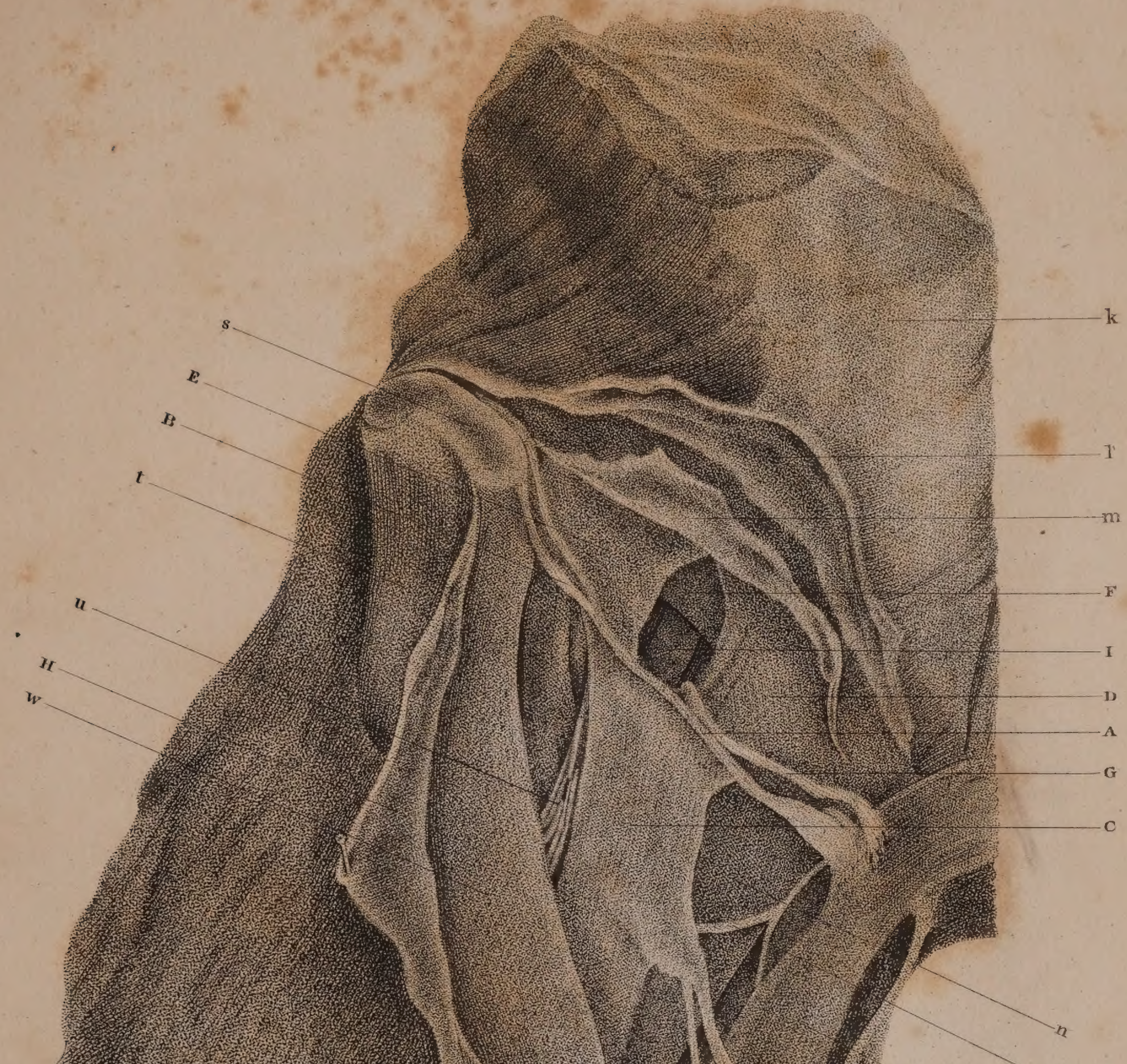
PLATE II.



B. A. Vitry del.

A. B. Durand sc

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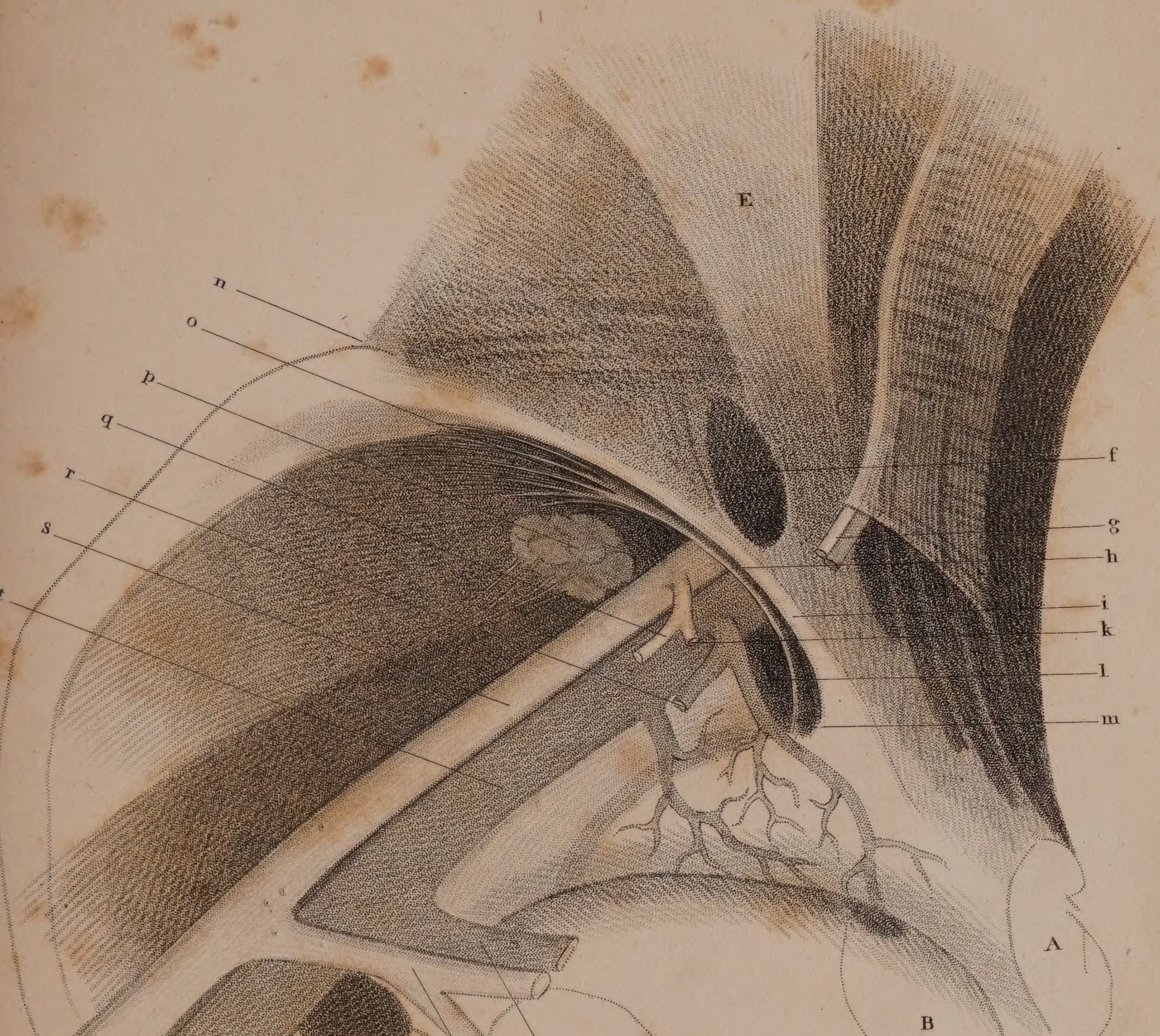
PLATE III



A.B.Durand del. et sc.

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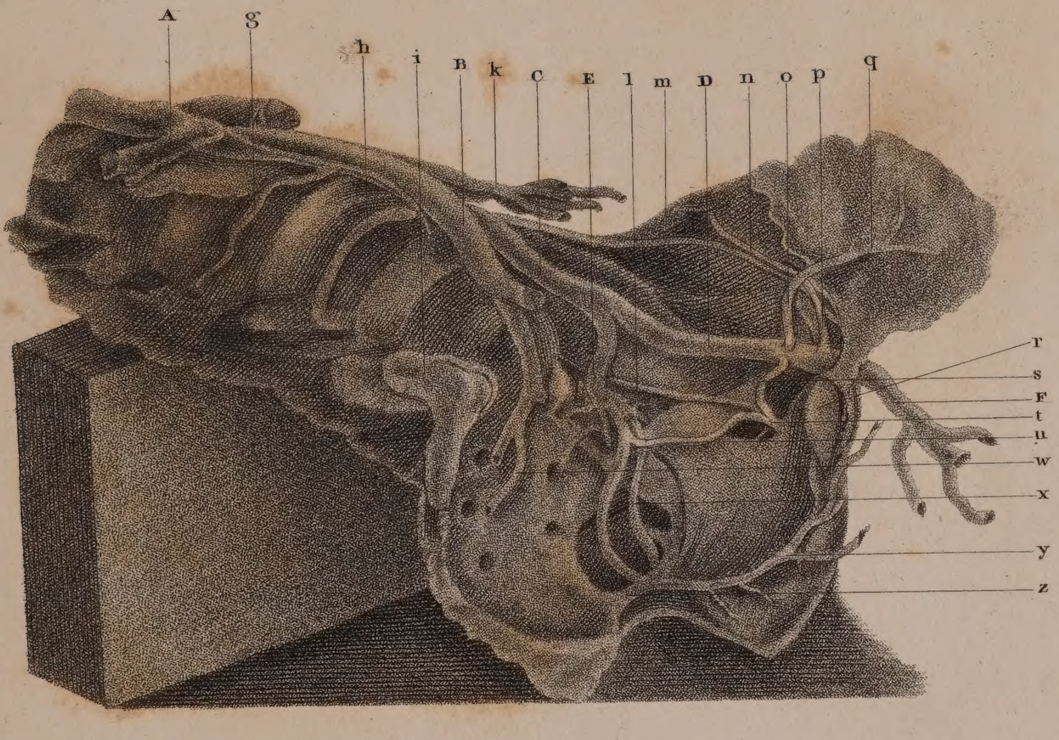
PLATE IV.



B. A. Vitry del.

A. B. Durand sc.

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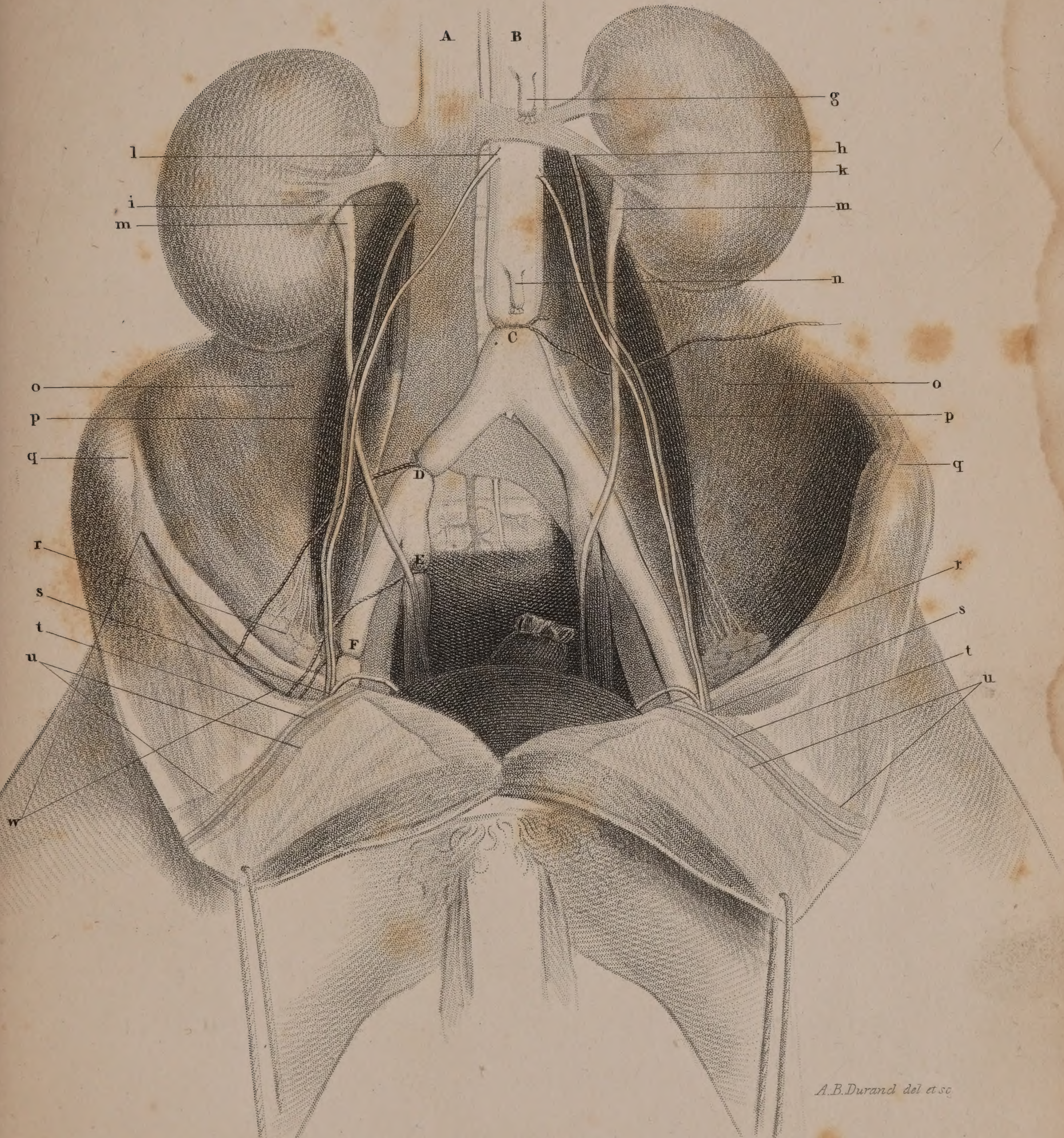
PLATE V.



A.B.Durand del et sc.

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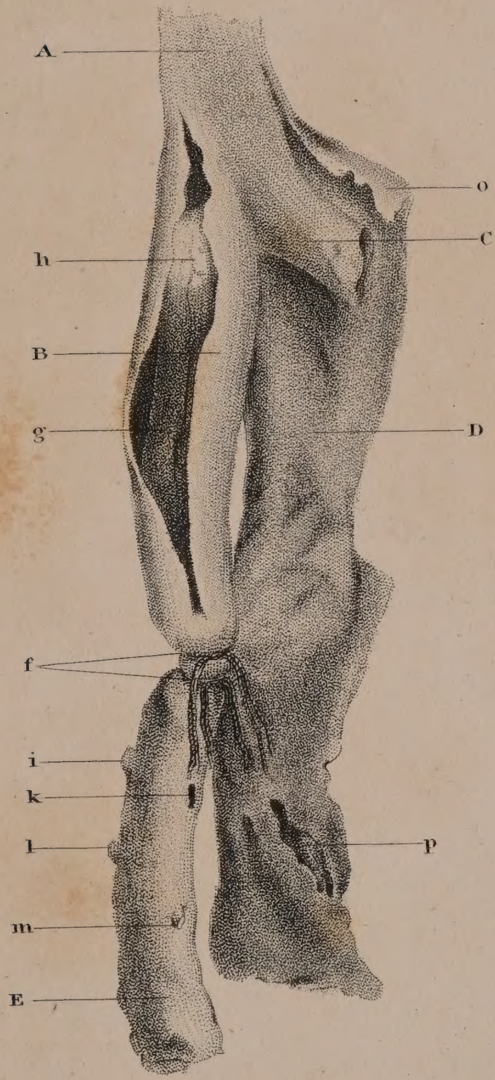
PLATE VI.



A. B. Durand del et sc.

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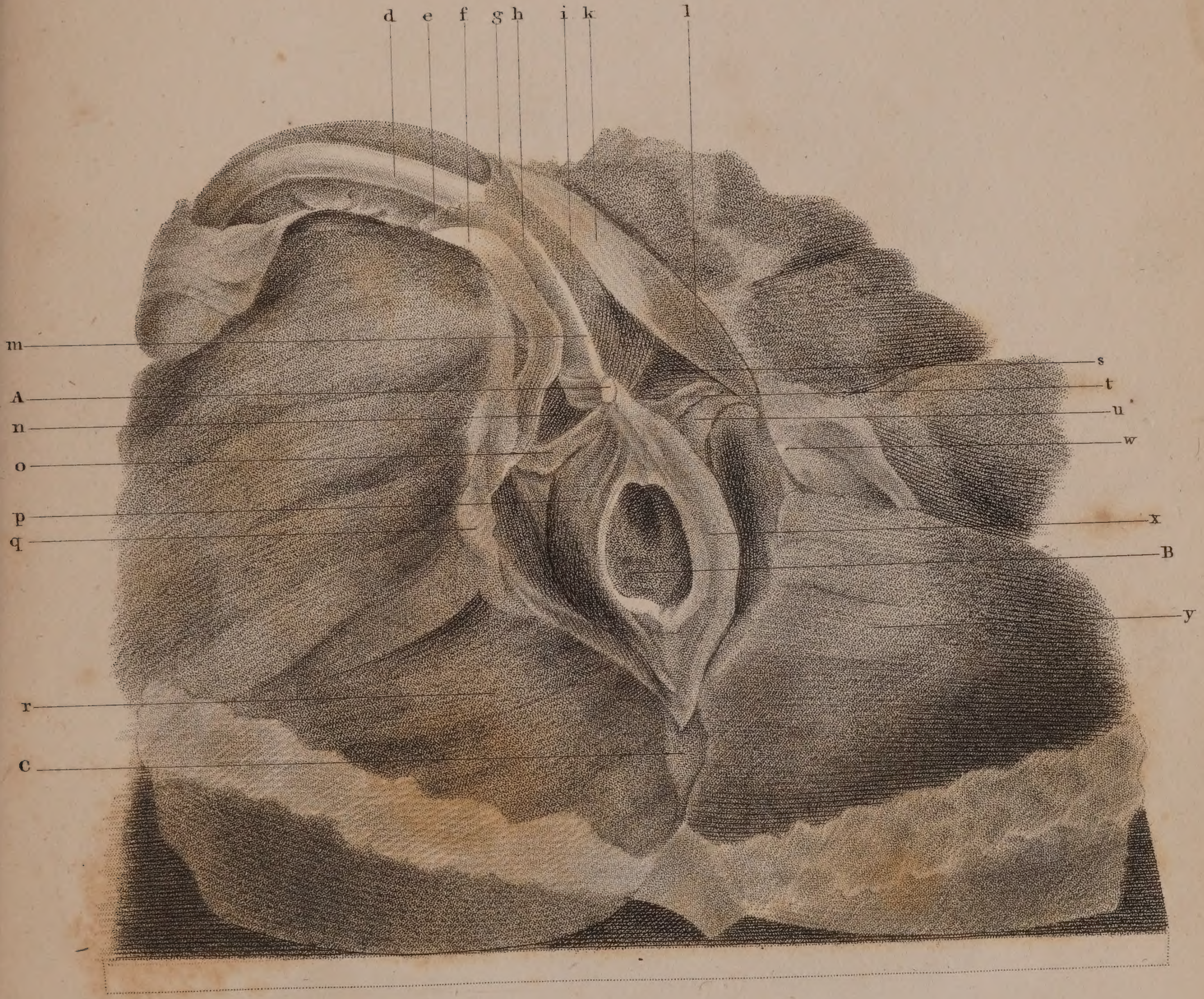
PLATE VII.



B. A. Vitry del.

A. B. Durand sc.

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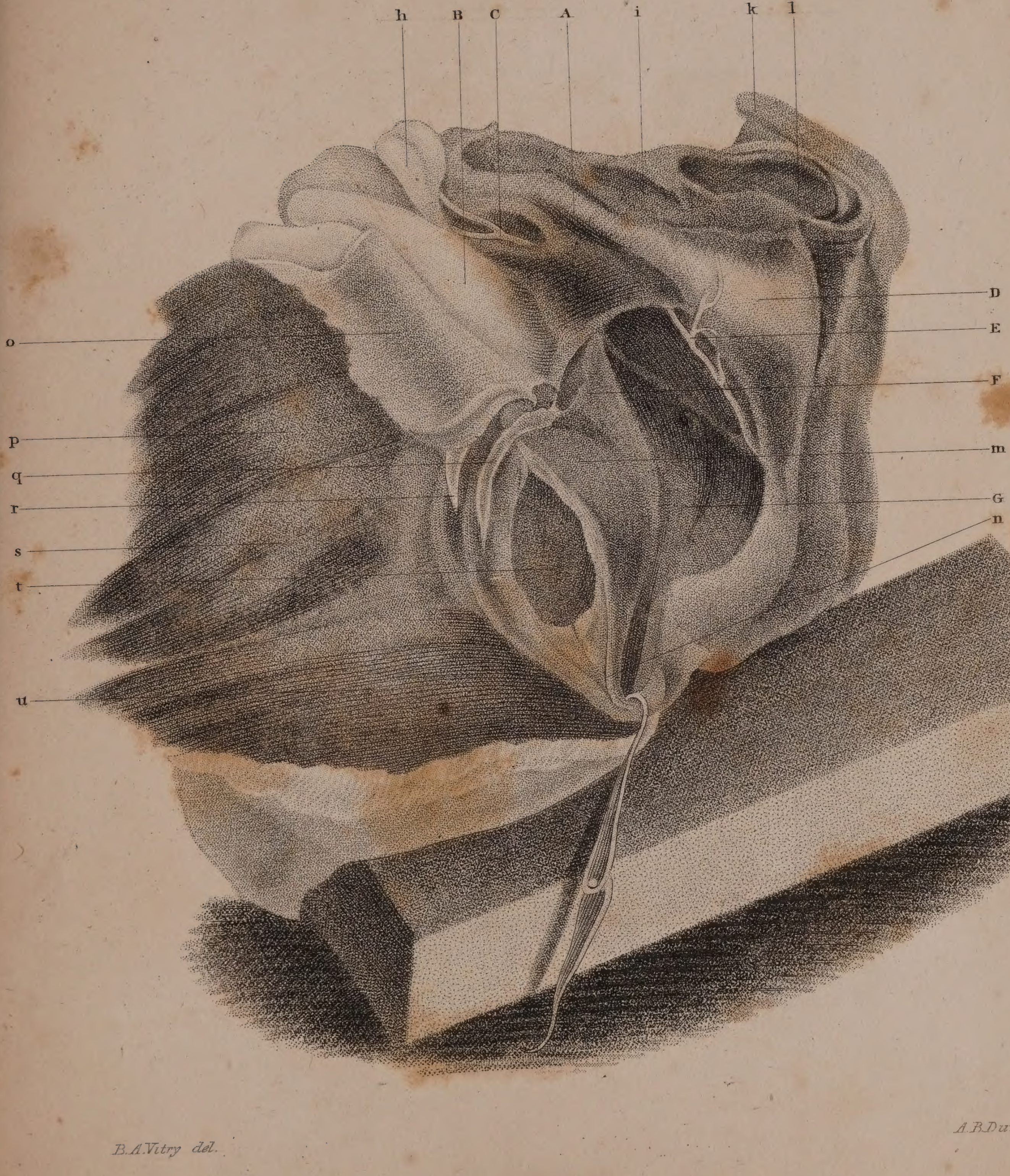
PLATE VIII



B. A. Vitry del.

A. B. Durand sc.

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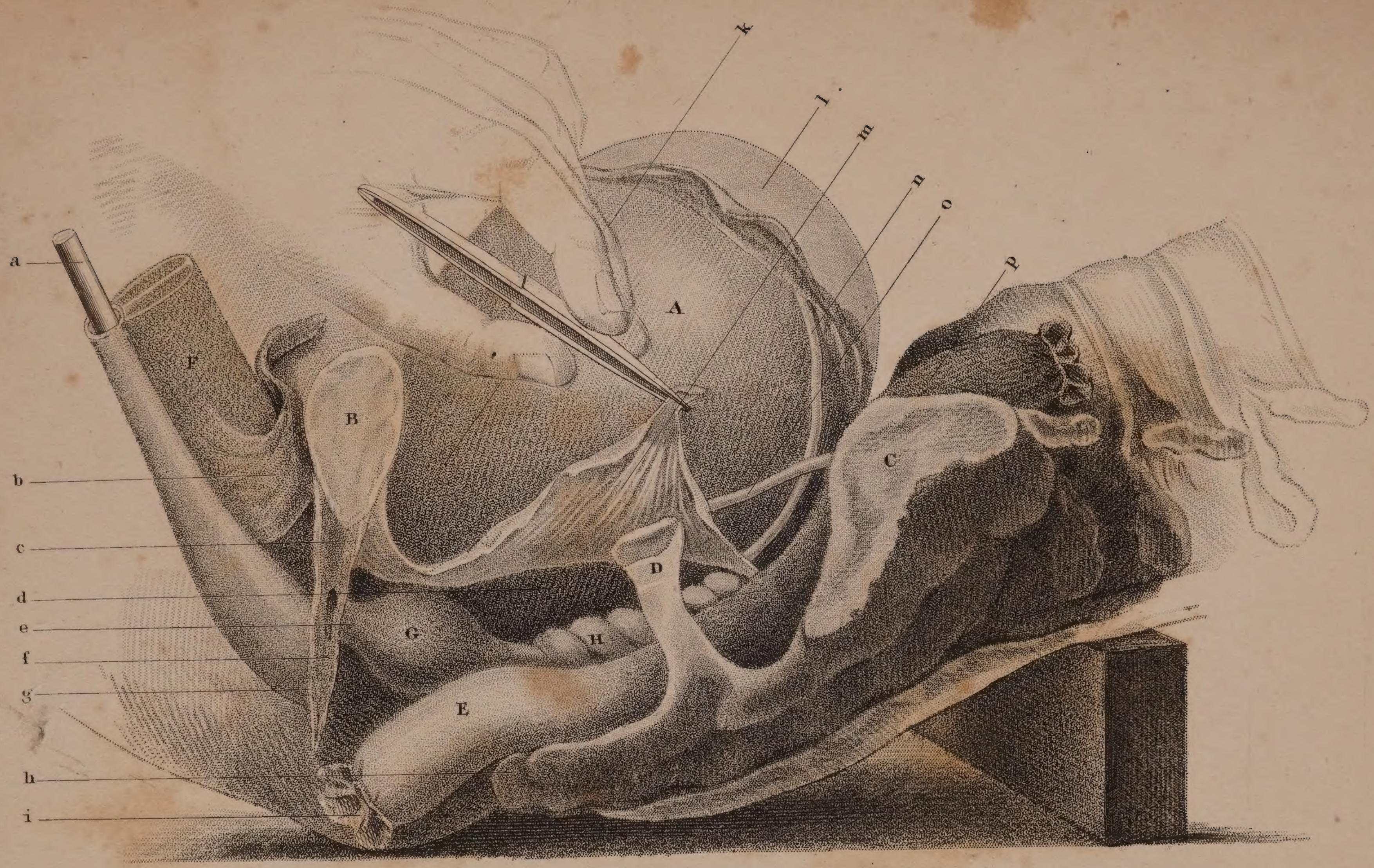
PLATE IX.



A.B.Durand del. et sc.

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